American Polywater® Corporation

Electronic Catalog

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ADHESIVES | CLEANERS | LUBRICANTS | SEALANTS



Cable Lubricants

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American Polywater® Corporation

11222 60th Street North
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Telephone: 1-651-430-2270
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TO: Consulting Electrical Engineers

SUBJ: Cable Pulling Lubricant Specification

WHY SPECIFY A CABLE LUBRICANT?

Why specify something that is not a functioning part of an electrical system, such as a cable pulling lubricant? "All cable lubricants are the same!" ***Or, are they?***

LUBRICANT'S SIGNIFICANCE!

The **differences** between lubricant types can affect both cable life and the safety of the projects you engineer.

- *Wax emulsions can damage certain types of insulation and high voltage shields.*
- *The residue from wax emulsions is combustible and can propagate flame.*
- *The residue left after a wax emulsion dries can hinder future cable removal or pulls.*

American Polywater Corporation is the recognized leader in the technology of polymeric cable lubricants. Our premier, high-performance electrical cable lubricant**, Polywater® LZ** is a safe, water-based product without the drawbacks of a wax emulsion**. Polywater® LZ** has been specified and used extensively in construction, based on its proven effectiveness, compatibility, safety, and application properties.

POOR INSTALLATION CAUSES FAULTS!

Cable manufacturers agree that **most cable faults** occur because of mechanical stress on the cable jacket during installation. **Polywater® LZ** has a low friction coefficient, which will minimize such mechanical stress.

ADDITIONAL INFORMATION?

In addition to the technical data in this catalog, we have available a formal presentation and video covering "Cable Installation Engineering." Topics covered are:

1. *Friction theory and its effect on cable installation tension.*
2. *Accurate coefficient of friction determination and its use in planning conduit systems.*
3. *Use of a personal computer with the Pull-Planner™ 3000 Software Program to easily design conduit systems.*
4. *Lubricant performance differences.*

A pre-written model lube specification is available online at
http://www.polywater.com/modelspc.html

To schedule a presentation on this subject, go to:
www.polywater.com/seminar.pdf

For additional technical information, please call us toll free at 1-800-328-9384.

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Recommended Lubricant Quantity

Our recommendation on the amount of Polywater® Cable Lubricant to use is dependent only on the size and length of the conduit system. Our research indicates that the following equation predicts a satisfactory quantity of Polywater® Lubricant for an average cable pull.

$$Q = .0015 \times L \times D$$

Where: Q = Quantity needed in gallons
L = Length of conduit in feet
D = nominal ID of conduit in inches

The appropriate quantity for use on any given pull can vary from this recommendation by 50%, depending on the complexity of the pull. Consider the following factors:

- **Cable weight and jacket hardness**
  (Increase quantities for stiff, heavy cable)
- **Conduit Type and Condition**
  (Increase quantities for old, dirty, or rough conduits)
- **Conduit Fill**
  (Increase quantities for high percent conduit fill)
- **Number of Bends**
  (Increase quantities for pulls with several bends)
- **Pulling Environment (heat, water, etc)**
  (Increase quantities for high temperatures)

The following chart indicates approximate pulling lubricant requirements for various cable pulls, based on the formula above.

Lubricant Quantities in Gallons

		Conduit ID in Inches			
		1”	**2”**	**3”**	**4”**
Pull Length in Feet	200	.3	.6	.9	1.2
	400	.6	1.2	1.8	2.4
	600	.9	1.8	2.7	3.6
	800	1.2	2.4	3.6	4.8
	1000	1.5	3.0	4.5	6.0

For cable pulling tips and research, visit our Engineer’s Corner online at http:www.polywater.com/engineer.asp

Polywater® Pull-Planner™ 4.0

CABLE PULLING SOFTWARE

Pull-Planner 4.0 Report

Pull Description: Pull Example
Pull Filename: Pull-Planner Flyer Printout 10-11-17.xpll

Conduit ID: 4 Inch(es) Conduit Fill: 27%

Total of 3 cable(s) of 1 different type(s) being pulled.

Type #1 3 Cable(s) O.D. of 1.2 inch(es) weight of 1.105 lbs/ft

Total cable weight: 3.315 lbs/ft
Calculated weight correction factor: 1.24

Configuration: Cradled

Jam/Clearance Analysis: Jamming Not Probable

Polywater® LZ with Jacket: LLDPE and Conduit: Rigid Steel

Pull Detail Summary

Total (Cumulative) Bend: 315 degrees
Total Length Including Bends: 824 feet
Conduit Fill 27 %
Total Cable Weight: 3.3 lbs per foot
Conduit Condition: Poor

Recommended Quantity : 9 Gallons
Lubricant Notes

Lubricant Best COF Value: 0.100
Un-Lubricated COF Value: 0.450

* Additional lubricant in recommended quantity based on long pull length.
* Additional lubricant in recommended quantity based on total degree of bend.
* Additional lubricant in recommended quantity based on conduit condition.

Incoming Tension: 300 lbs Pull COF: 0.1

Seg #	Straight Section Slope (°)	Slope Direction	Straight Section Length (ft)	Straight Section COF	Tension (lbs)	Bend Type	Bend Direction	Bend Radius (ft)	Bend Angle (°)	Bend Length (ft)	Bend COF	Tension (lbs)	Sidewall Pressure (lbs/ft)
1	90.0	Down	8.0	0.1	273.48	Vertical Up	Down	3.00	90.0	4.7	0.1	320.00	61.00
2	—	—	200.00	0.1	402.21	Horizontal	—	3.00	45.0	2.4	0.1	443.00	85.00
3	—	—	500.00	0.1	648.53	Horizontal	—	3.00	90.0	4.7	0.1	788.00	151.00
4	—	—	100.00	0.1	829.11	Vertical Up	Up	3.00	90.0	4.7	0.1	1017.00	194.00

Conduit design printout from the Pull-Planner 4.0

Program for Cable Pulling Tension Calculation and Conduit System Design

PRODUCT BENEFITS

- **Intuitive Operation:** User-friendly menus and control buttons.
- **Customized Database**: Unlimited number of cables can be put in easy-to-use database.
- **Flexible:** Push/pull, variable friction, rollers, pull reverse, back calculation, and more.
- **Operates on Standard Windows®:** Allows data transfer for word processing, printing, and saving.
- **Universal:** Runs metric or English units.

Achieve Longer Pulls by Keeping Tension Low

Pull-Planner™ 4.0 for Windows® calculates cable pulling tension and sidewall pressure around bends using the pulling equations. The Pull-Planner 4.0 also utilizes industry standards to calculate maximum pulling tension and conduit fill. Plan conduit systems prior to the pull.



Cable tension gauges



Large cable pulling machine

polywater.com | 651-430-2270

American Polywater® Corporation



Amp-type tensiometer



Portable heavy-duty cable puller

Pulling Wire and Cables the Right Way is Critical

Make the right decision on cable pull direction. The Pull-Planner 4.0 easily shows optimal pull direction. It helps eliminate splices, plan for future system upgrades, and reduce the chances of cable damage. An excellent tool for cable system specification.

POLYWATER PULL-PLANNER 4.0

Catalog #	Package Description	Units/Case
PP-40	Internet Download	1

SPECIFICATIONS AND APPLICATIONS:

- **System Requirements:** Pull-Planner 4.0 for Windows is available exclusively as an Internet download. It runs on numerous Windows operating systems. Total installation consumes 30 megabytes of hard drive space.
- **Previous Versions:** Accepts pull and cable data saved under the previous Pull-Planner software versions.
- **Training:** On-site seminars and webinars are available. Video tutorial is located on the Pull-Planner 4.0 web page. Please call us to set up an engineering seminar for your company.

CONTACT US

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American Polywater expressly disclaims any implied warranties and conditions of merchantability and fitness for a particular purpose. American Polywater's only obligation shall be to replace such quantity of the product proven to be defective. Except for the replacement remedy, American Polywater shall not be liable for any loss, injury, or direct, indirect, or consequential damages resulting from product's use, regardless of the legal theory asserted.

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Polywater® LZ

UNIVERSAL CABLE PULLING LUBE



Effectively coats cable during long pulls

Low-Smoke Zero-Halogen, CPE and CSPE Cable Compatible

PRODUCT BENEFITS

- **Low Friction Coefficient:** Maximum tension reduction on all types of cable jackets.
- **Universal:** Suitable for all types of jackets and cable.
- **Specification Grade:** Meets the performance requirements of power and petrochemical plants, mass transit systems, airports, and high-occupancy buildings.
- **Compatible:** Tested on LSZH/LSHF thermoplastic and thermoset jackets.
- **Safe:** Suitable for use on CSPE fire-retardant cable jackets.

Can be Used on All Types of Cable Jackets

Polywater® LZ offers proven cable compatibility, superior combustion resistance, and an inherently low coefficient of friction. Polywater LZ should be specified for installations of LSZH/LSHF cable in ducts and where fire propagation is a concern.



Available in Front End Pack™



Easily hand applied

polywater.com | 651-430-2270

American Polywater® Corporation



Quarts are perfect for smaller conduits


Polywater LZ package options

One Lubricant for All Types of Cable and Conditions

Polywater LZ comes in two grades: Regular Grade LZ and Winter Grade WLZ (for cold weather use in temperatures as low as -20°F/-30°C). Specify Polywater LZ to ensure that cable installers use a universally compatible lubricant.

POLYWATER LZ

Catalog #	Package Description	Units/Case
LZ-35 / WLZ-35	1-qt. bottle (0.95 liter)	12
LZ-55 / WLZ-55	½-gal. Front End Pack in a carton (0.95 liter)	6
LZ-110 / WLZ-110	½-gal. Front End Pack in a 5-gal. pail (1.9 liters)	10
LZ-128 / WLZ-128	1-gal. pail (3.8 liters)	4
LZ-640 / WLZ-640	5-gal. pail (18.9 liters)	1
LZ-DRUM / WLZ-DRUM	55-gal. drum (208 liters)	1

*W in the catalog number indicates Winter Grade version.

SPECIFICATIONS AND APPLICATIONS:

- **Cable Compatibility:** Passes IEEE 1210 physical and electrical testing on a wide variety of cable materials. It does not stress crack polyethylene. Refer to the technical bulletin for details.
- **Friction Testing:** Shows excellent lubricity on a variety of cable jacket types. The following COFs were measured using Rigid Steel conduit: LSZH .15, CPE .13, CSPE .21, LLDPE .10; FRP conduit: LSZH .17, CPE .17, CSPE .24, LLDPE .11; PVC conduit: LSZH .07, CPE .10, CSPE .16, LLDPE .05.
- **Physical Properties:** Dries slippery. It leaves little residue and won't cement cables into conduit. Contains no wax, or grease.

CONTACT US

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Polywater® LZ
High Performance Lubricant

American Polywater® Corporation

TECHNICAL SPECIFICATION

Description:

Polywater® Lubricant LZ is a high-performance, specification-grade, cable pulling lubricant. This newest Polywater® Lubricant was developed for compatibility with the broad variety of modern LSZH/LSHF compounds. Polywater® LZ is also compatible with other high-performance cable jackets. It provides excellent tension reduction and is recommended for all types of cable pulling.

Polywater® LZ is slow drying and leaves a thin, slippery film that retains its lubricity for months after use. Lubricant LZ does not sustain flame when used with fire-retardant cables and systems. Its dried residue is non-conductive and non-combustible.

Polywater® Lubricant LZ is a stringy gel. It can be applied by hand or using Polywater's LP Pumps. It is also available in the unique Front End Pack™ pre-lubrication bags.



Friction Testing:

Lubricity: Polywater® LZ Lubricant shows superior friction reduction on a variety of jacket types. Typical friction coefficients at 200 lbs/ft (2.91 kN/m) normal pressure are shown. Test results are based on the method described in the white paper, "Coefficient of Friction Measurement on Polywater's Friction Table, 2007" (polywater.com/FTable.pdf). Values are averages based on cable jacket and conduit materials from multiple manufacturers.

Cable Jacket	Conduit Type				
	Steel	FRP	HDPE	PVC	EMT
LSZH	.15	.17	.07	.07	.21
CSPE	.21	.24	.12	.16	.24
CPE	.13	.17	.06	.10	.16
XLPE	.10	.12	.04	.05	.11
LLDPE	.10	.11	.04	.05	.13

Coefficient of friction data on additional or specific cable jackets or conduits can be obtained from American Polywater Corporation.

Product Benefits:

- Specification grade
- Compatible with cable jacket materials
- Extensively tested on LSZH compounds
- Excellent friction reduction
- High cling factor
- Non-combustible residue
- Clean and non-staining
- Temperature stable

End Use:

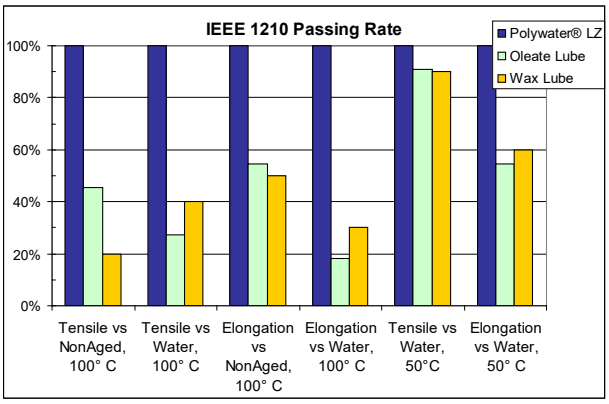
Suitable for all types of cable installations, including:

- Nuclear and other generation plants
- Mass transit systems
- Oil and petrochemical
- Other critical fire areas
- Multi-bend cable pulls

Cable Compatibility:

Tensile and Elongation:
LSZH, CSPE, LLDPE, XLPE, CPE, and PVC cable jacket materials aged in Polywater® Lubricant LZ per IEEE Standard 1210[1] meet the tensile and elongation retention requirements of that standard.

Modern LSZH jackets are numerous and vary significantly in formulation. Polywater® LZ shows broad compatibility with this jacket technology. As shown in the graph below, the common cable pulling lubricants available through local supply houses show significant and sometimes devastating effects on LSZH cable jackets.



Polyethylene Stress Cracking:
Polywater® LZ shows no stress cracking on LDPE, MDPE, or HDPE cable jacket when tested per IEEE Standard 1210[1].

Volume Resistivity:
There are no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when volume resistivity is tested according to IEEE Standard 1210[1].

Building Wire Testing:
THHN and XLPE building wire meet UL tensile, elongation, and voltage withstand requirements after exposure to Polywater® LZ Lubricant as tested by UL requirements[2].

Cable Approvals:
Polywater® Lubricant LZ is approved by many cable manufacturers. Contact American Polywater for details.

[1] *IEEE Std 1210-2004; IEEE Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable.*

[2] *UL Subject 267, Investigation for Wire-Pulling Compounds.*

Performance Properties

Cling Factor:
Cling factor is a measure of the ability to apply the lubricant and have it stay on the jacket while the cable enters the conduit.

A six-inch length (152 mm) of a one-inch (25 mm) diameter cable will hold at least 35 grams of Polywater® Lubricant LZ for one minute when held vertically at 70° F (21° C).

Coatability:
Coatability is a measure of the lubricant's ability to coat the jacket as a thin film for continued lubricity on longer pulls.

Polywater® LZ will wet out evenly on cable jacket surfaces. It will not bead up or rub off of the jacket sample. A one-inch (25 mm) diameter XLPE cable dipped six inches (152 mm) into Polywater® Lubricant LZ, then withdrawn and held vertically, will retain at least 25 grams of Polywater® Lubricant LZ for one minute at 70° F (21° C).

Combustibility:
Combustibility is a measure of combustion properties of the lubricant residue in a fire situation (with an impinging heat flux).

Polywater® LZ has no flash point and its dried residue will not support combustion and spread flame. A 15-gram sample of the LZ Lubricant, when placed in a one-foot, split metal conduit and fully dried for 24 hours at 105°C, will not ignite and spread a flame more than three inches beyond the point of ignition when subjected to a continuous heat flux of 85 kW/m^2. The total test time was one-half hour.

Test method described in "Fire Parameters and Combustion Properties of Cable Pulling Compound Residues," presented to the International Wire & Cable Symposium, 1987.

Physical Properties:

Property	Result
Appearance:	White, stringy gel
% Non-Volatile Solids (weight):	4.0
VOC content:	0 gms/L 200 gms/L (wintergrade)
Viscosity (Brookfield):	35,000 – 50,000 cps @10 rpm
pH:	6.5 – 7.5

Application Properties:

Application Systems:
Polywater® LZ has a stringy gel consistency that makes it easy to lift, carry and hand apply.

Polywater® LZ can also be pumped directly into the conduit or onto the cable using the Polywater® LP-3 or LP-D5 specialty lubricant pumps. Pumps allow hands-free transfer and consistent application of lubricant. Polywater's low-shear pumps will not change the gel character of LZ lubricant. The LP-3 and LP-D5 pumps support lubricant application rates of 1 to 3 gallons (4 to 11 liters) per minute.

Polywater® LZ Front End Packs™ are bag packages that "pre-lubricate" the head end of the cable during the pull. The Front End Pack™ attaches to the winch line and pre-lubricates as it goes through the conduit. Two sizes are available to fit 2" and larger conduits.

Pull-Planner™ Tension Calculation Software is available from Polywater. Pulling tension estimations can ensure the use of appropriate pulling equipment and that the cable is installed within safe limits.

Polywater® LZ is also available in a special-order, pourable version (lower viscosity) called Polywater® PLZ. PLZ is primarily for underground work where pouring the lubricant into a cable feeder tube is a convenience.

Temperature Use Range:
Polywater® LZ:
20°F to 120°F (-5°C to 50°C).
Polywater® WLZ (wintergrade version):
-20°F to 120°F (-30°C to 50°C)

Temperature Stability:
Polywater® LZ will not phase-out or separate after five freeze/thaw cycles or 5-day exposure at 120°F (50°C).

Clean-Up:
Polywater® LZ is non-staining. Complete clean-up is possible with water.

Storage and Shelf Life:
Store Polywater® LZ in a tightly sealed container away from direct sunlight. Lubricant shelf life is one year.

Directions for Use:

Polywater® LZ Lubricant can be hand applied or pumped onto the cable as it enters the conduit.

For long pulls, place approximately two-thirds of the recommended quantity of lubricant into the conduit using the Front End Packs™ or by pumping.

For Front End Packs™ use, attach the packs of Polywater® LZ to the winch line or pulling rope in front of the cable by using tape or cable ties. Start the pull and slit open the entire length of the pack(s) with a sharp knife as it enters the conduit.

Supplement with direct jacket lubrication as the cable enters the conduit.

Clean-up by wiping off any excess lubricant with a rag.

Recommended Lubricant Quantity:

$$Q = k \times L \times D$$

Where:
Q = quantity in gallons (liters)
L = length of conduit run in feet (meters)
D = ID of the conduit in inches (mm)
k = 0.0015 (0.0008 if metric units)

The quantity that is appropriate for any given pull can vary from this recommendation by 50%, depending on the complexity of the pull. Consider the following factors:

Cable weight and stiffness
(Increase quantity for stiff, heavy cable)

Conduit condition
(Increase quantity for old, dirty or rough conduits)

Conduit fill
(Increase quantity for high percent conduit fill)

Number of bends
(Increase quantity for pulls with several bends)

Pulling environment
(Increase quantity for high temperatures)

Model Specification:

The statement below may be inserted into a specific job specification to help maintain engineering standards and ensure project integrity.

The cable pulling lubricant shall be Polywater® LZ Lubricant. The cable pulling lubricant shall provide excellent friction reduction with good cling and wetting through long pulls and multiple bends. The lubricant shall leave minimal, non-combustible residue. It shall be compatible with most cable jacket materials and be extensively tested on a broad variety of low smoke, halogen-free cable jacket materials.

Cable jacket compatibility shall be tested with the specific LSZH jacket material used on the cable. Test data shall be provided by the cable manufacturer or the lubricant manufacturer. It shall not stress crack polyethylene per ASTM Standard 1693. There shall be no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when the lubricant's effect on volume resistivity is tested according to IEEE Standard 1210.

A 15-gram sample of the lubricant, when placed in a one-foot, split metal conduit and fully dried for 24 hours at 105 degrees C, shall not spread a flame more than three inches beyond a point of ignition at a continued heat flux of 85 kW / meter^2. Total time of test shall be one-half hour.

Order Information:

Cat #	Package Description
	Regular
LZ-27	1-qt bag in a box (0.95 liter)
LZ-99	1-qt bag in a pail (0.95 liters)
LZ-55	½-gal bag in a box (1.9 liters)
LZ-110	½-gal bag in a pail (1.9 liters)
LZ-35	1-qt squeeze bottle (.95 Liter)
LZ-128	1-gallon pail (3.78 Liter)
LZ-640	5-gallon pail (18.9 Liter)
LZ-DRUM	55-gallon drum (208 Liter)
	Wintergrade
WLZ-55	½-gal bag in a box (1.9 liters)
WLZ-110	½-gal bag in a pail (1.9 liters)
WLZ-35	1-qt squeeze bottle (.95 liter)
WLZ-128	1-gallon pail (3.78 liter)
WLZ-640	5-gallon pail (18.9 Liter)
	Pourable
PLZ-128	1-gallon pail (3.78 Liter)
PLZ-640	5-gallon pail (18.9 Liter)

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Lit-LZTech/REV000

Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ 3000 Software

American Polywater® Corporation

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Polywater® J

CABLE PULLING LUBRICANT



Polywater J is easily applied by the LP-D5 pump

Proven High-Performance Cable Lubricant for Heavy Cable Installations

PRODUCT BENEFITS

- **Maximum Friction Reduction:** For low cable pulling tension.
- **Clean and Non-Staining:** Minimizes clean-up time.
- **Field-Friendly Application:** Can be pumped, hand applied, or distributed by Front End Pack™.
- **Temperature Stable**: No ruined lubricant from freeze/thaw or high-temperature exposure.
- **High Cling Factor:** Stays on cable jacket during application.

The Most Used and Specified Cable Lubricant

Specification-grade Polywater® Lubricant J is a high-performance, clean, slow-drying, water-based gel lubricant. Lubricant J provides maximum tension reduction in all types of cable pulling. It is recommended for long pulls, multiple-bend pulls, and pulls in a hot environment.


Easily applied by hand


Front End Pack prelubricates conduit

polywater.com | 651-430-2270

American Polywater® Corporation



Quarts are handy for smaller conduits


Packaged for all installation types

Package Options for All Applications

Polywater J comes in two grades: Regular Grade J and Winter Grade WJ (for cold weather use in temperatures as low as -20˚F (-30˚C)). A pourable version (Polywater PJ) is also available. The Front End Pack is a conduit-sized polyethylene bag of lubricant that travels through the conduit on the winch line or pull rope, prelubricating the conduit ahead of the cable being pulled. Lubricant J dries to form a thin lubricating film that retains its lubricity for months after use.

POLYWATER J

Catalog #	Package Description	Units/Case
J-35 / WJ-35	1-qt. bottle (0.95 liter)	12
J-27 / WJ-27	1-qt. Front End Pack in a carton (0.95 liter)	12
J-99 / WJ-99	1-qt. Front End Pack in a 5-gal. pail (0.95 liter)	16
J-55 / WJ-55	½-gal. Front End Pack in a carton (1.9 liters)	6
J-110 / WJ-110	½-gal. Front End Pack in a 5-gal. pail (1.9 liters)	10
J-128 / WJ-128	1-gal. pail (3.8 liters)	4
J-640 / WJ-640	5-gal. pail (18.9 liters)	1
J-DRUM / WJ-DRUM	55-gal. drum (208 liters)	1

*W in the catalog number indicates Winter Grade version.

SPECIFICATIONS AND APPLICATIONS:

- **Cable Compatibility:** Passes IEEE 1210 physical and electrical testing on a wide variety of cable materials. It does not stress crack polyethylene. Refer to the technical bulletin for details.
- **Friction Testing:** Shows excellent lubricity on a variety of cable jacket types. Using PVC conduit, the following COFs were measured: PVC .11, XLPE .11, LLDPE .11, HDPE .09, THHN .13, XHHW .11. Method described in “Coefficient of Friction Measurement on Polywater’s Friction Table, 2007”. Typical values determined using 200 lbs/ft normal force.
- **Formula:** Contains no wax, grease, or silicone.
- **Temperature Range:** Has a wide temperature use range: 20˚F to 120˚F (-5˚C to 50˚C); Winter Grade Polywater® WJ: -20˚F to 120˚F (-30˚C to 50˚C).

CONTACT US

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Polywater® J
High Performance Lubricant

American Polywater® Corporation

TECHNICAL SPECIFICATION

Description:

Polywater® Lubricant J is a high-performance cable pulling lubricant proven in the installation of millions of feet (meters) of cable over the last 20 years. Lubricant J provides excellent tension reduction in underground and industrial cable pulls. It is recommended for both communications and electrical cable. Polywater® J has excellent shear resistance for effective lubrication under high cable sidewall pressure in conduit bends.

The residue from Polywater® J does not propagate flame when used with fire-retardant cable systems. Lubricant J is slow drying. The residue is a thin, slippery film that retains its lubricity for months after use. Its dried residue is non-conductive and non-combustible.

Polywater® Lubricant J is a stringy gel. It can be applied by hand or using Polywater's LP Pumps. It is also available in the unique Front End Pack™ pre-lubrication bags.

Friction Testing:

Lubricity: Polywater® J Lubricant shows superior friction reduction on a variety of jacket types. Typical friction coefficients at 200 lbs/ft (2.91 kN/m) normal pressure are shown. Test results are based on the method described in the white paper, "Coefficient of Friction Measurement on Polywater's Friction Table, 2007" (polywater.com/FTable.pdf). Values are averages based on cable jacket and conduit materials from multiple manufacturers.

Cable	Conduit Type				
Jacket	HDPE	PVC	Steel	FRP	EMT
XLPE	.14	.11	.13	.16	.21
LLDPE	.10	.11	.16	.13	.13
PVC	.11	.11	.13	.16	.11
HDPE	.05	.09	.13	.13	.13

Coefficient of friction data on additional or specific cable jackets or conduits came be obtained from American Polywater Corporation.



Product Benefits:

- Specification grade
- Excellent friction reduction
- High cling factor
- Non-combustible residue
- Clean and non-staining
- Temperature stable

End Use:

Suitable for many types of cable installations, including:

- Heavy, underground installations
- Multiple-bend pulls
- Long pulls
- High conduit fill situations

Official Approvals:

UL Approved
CSA Listed

Cable Compatibility:

Polyethylene Stress Cracking:
Polywater® J shows no stress cracking on LDPE, LLDPE, MDPE, or HDPE cable jacket when tested per IEEE Standard 1210[1].

Tensile and Elongation Effects:
LLDPE, XLPE, PVC and EPR cable jacket materials aged in Polywater® Lubricant J per IEEE Standard 1210[1] meet the tensile and elongation retention requirements of that standard.

Volume Resistivity:
There are no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when volume resistivity is tested according to IEEE Standard 1210[1].

Building Wire Testing:
THHN and XHHW building wire meet UL tensile, elongation, and voltage withstand requirements after exposure to Polywater® J Lubricant as tested by UL requirements[2].

Nuclear Approval:
Polywater® J Lubricant does not contain halogenated compounds, sulfur compounds, or low melting point metals.[3]

Cable Approvals:
Polywater® J Lubricant is approved by most cable manufacturers. Contact American Polywater for details.

[1] *IEEE Std 1210-2004; IEEE Standard Tests for Determining Compatibility of Cable Pulling Lubricants with Wire and Cable.*

[2] *UL Subject 267, Investigation for Wire-Pulling Compounds.*

[3] *Nuclear Test Methodology: Leachable Chlorides (ASTM D 512-88), Water Leachable Bromides (ASTM D 1246-88) Halogenated Compounds (ASTM D 808-87) Water Leachable Iodides (ASTM D 1246-88) Sulfur (ASTM D 129-78) Water Leachable Fluorides (ASTM D 1179-88)*

Performance Properties

Cling Factor:
Cling factor is a measure of the ability to apply the lubricant and have it stay on the jacket while the cable enters the conduit.

A six-inch length (152 mm) of a one-inch (25 mm) diameter cable will hold at least 50 grams of Polywater® Lubricant J for one minute when held vertically at 70° F (21° C).

Coatability:
Coatability is a measure of the lubricant's ability to coat the cable jacket as a thin film for continued lubricity on longer pulls.

Polywater® J will wet out evenly on cable jacket surfaces. It will not bead up or rub off of the jacket sample. A one-inch (25 mm) diameter XLPE cable dipped six inches (152 mm) into Polywater® J, then withdrawn and held vertically, will retain at least 30 grams of Polywater® Lubricant J for one minute at 70° F (21° C).

Combustibility:
Combustibility is a measure of combustion properties of the lubricant residue in a fire situation (with an impinging heat flux).

Polywater® J has no flash point and its dried residue will not support combustion and spread flame. A 200-gram sample of the J Lubricant, when placed in a one-foot, split metal conduit and fully dried for 24 hours at 105°C, will not ignite and spread a flame more than three inches beyond a point of ignition when subjected to a continuous heat flux of 40 kW/m^2. The total test time was one-half hour.

Test method described in "Fire Parameters and Combustion Properties of Cable Pulling Compound Residues," presented to the International Wire & Cable Symposium, 1987.

Physical Properties:

Property	Result
Appearance:	Cream-colored, stringy gel
Wax, Grease and Silicone Content:	None
Percent Non-Volatile Solids:	4.3
VOC Content:	10 gms/liter 200 gms/liter (wintergrade)
Viscosity:	25,000 – 40,000 cps @10rpm
pH:	7.5 – 9.0

Application Properties:

Application Systems:
Polywater® J has a stringy gel consistency that makes it easy to lift, carry and hand apply.

Polywater® J can also be pumped directly into the conduit or onto a cable using the Polywater® LP-3 or LP-D5 specialty lubricant pumps. Pumps allow hands-free transfer and consistent application of lubricant. Polywater's low-shear pumps will not change the gel character of Polywater® J lubricant. The LP-3 and LP-D5 pumps support lubricant application rates of 1 to 3 gallons (4 to 11 liters) per minute.

Polywater® J Front End Packs™ are bag packages that "pre-lubricate" the head end of the cable during the pull. The Front End Pack™ attaches to the winch line and pre-lubricates as it goes through the conduit. Two sizes are available to fit 2" and larger conduits.

Pull-Planner™ Tension Calculation Software is available from Polywater. Pulling tension estimations can ensure the use of appropriate pulling equipment and that the cable is installed within safe limits.

Polywater® J is also available in a pourable version (lower viscosity) called Polywater® PJ. PJ is primarily for use in underground work where pouring the lubricant into a cable feeder tube is a convenience.

Temperature Use Range:
Polywater® J:
20°F to 120°F (-5°C to 50°C).
Polywater® WJ (wintergrade version):
-20°F to 120°F (-30°C to 50°C).

Temperature Stability:
Polywater® J will not phase-out or separate after five freeze/thaw cycles or 5-day exposure at 120°F (50°C).

Clean-Up:
Polywater® J is non-staining. Complete clean-up is possible with water.

Storage and Shelf Life:
Store Polywater® J in a tightly sealed container away from direct sunlight. Lubricant shelf life is one year.

Directions for Use:

Polywater® J Lubricant can be hand applied or pumped onto the cable as it enters the conduit. Polywater® PJ is a thinner gel and can be poured.

For long pulls, place approximately two-thirds of the recommended quantity of lubricant into the conduit using the Front End Packs™ or by pumping.

For Front End Pack™ use, attach the packs of Polywater® J to the winch line or pulling rope in front of the cable using tape or cable ties. Start the pull and slit open the entire length of the pack(s) with a sharp knife as it enters the conduit.

Supplement with direct jacket lubrication as the cable enters the conduit.

Clean-up by wiping off any excess lubricant with a rag.

Recommended Lubricant Quantity

$$Q = k \times L \times D$$

Where:
Q = quantity in gallons (liters)
L = length of conduit run in feet (meters)
D = ID of the conduit in inches (mm)
k = 0.0015 (0.0008 if metric units)

The quantity that is appropriate for any given pull can vary from this recommendation by 50%, depending on the complexity of the pull. Consider the following factors:

Cable weight and stiffness
(Increase quantity for stiff, heavy cable)

Conduit condition
(Increase quantity for old, dirty or rough conduits)

Conduit fill
(Increase quantity for high percent conduit fill)

Number of bends
(Increase quantity for pulls with several bends)

Pulling environment
(Increase quantity for high temperatures)

Model Specification:

The statement below may be inserted into a specific job specification to help maintain engineering standards and ensure project integrity.

The cable pulling lubricant shall be Polywater® J Lubricant. The lubricant shall be UL (or CSA) listed. The lubricant shall contain **no** waxes, greases, silicones, or polyalkylene glycol oils. Lubricant manufacturer must provide cable manufacturer approvals upon request.

Cable jacket compatibility shall be tested by the IEEE 1210, Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable. It shall pass physical compatibility tests on LLDPE, XLPE, PVC and EPR cable jacket or sheath materials. It shall not stress crack polyethylene per ASTM Standard 1693. There shall be no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when the lubricant's effect on volume resistivity is tested according to IEEE Standard 1210.

A 200-gram sample of the lubricant, when placed in a one-foot, split metal conduit and fully dried for 24 hours at 105 degrees C, shall not spread a flame more than three inches beyond a point of ignition at a continued heat flux of 40 kW / meter^2. Total time of test shall be one-half hour.

Order Information:

Cat #	Package Description
	Regular
J-35	1-quart squeeze bottle (0.95 liter)
J-128	1-gallon pail (3.78 liter)
J-640	5-gallon pail (18.9 liter)
J-27	1-quart bag (0.95 liter)
J-99	1-quart bag (0.95 liter) in a pail
J-55	½-gallon bag (1.9 liter)
J-110	½-gallon bag (1.9 liter) in a pail
J-Drum	55-gallon drum (208 liter)
	Pourable
PJ-128	1-gallon pail (3.78 liter)
PJ-320	2 ½- gallon jug (9.6 liter)
PJ-640	5-gallon pail (18.9 liter)
PJ-Drum	55-gallon drum (208 liter)
***Wintergrade version Polywater® PJ available (WPJ)*	
	Wintergrade
WJ-35	1-quart squeeze bottle (0.95 liter),
WJ-55	½-gallon bag (1.9 liter)
WJ-110	½-gallon bag (1.9 Liter) in a pail
WJ-128	1-gallon pail (3.78 liter)
WJ-640	5-gallon pail (18.9 liter)
WJ-Drum	55-gallon drum (208 liter)

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The statements contained herein are made in lieu of all warranties, express or implied, including, but not limited to, implied warranties of merchantability and fitness for a particular purpose, which warranties are hereby expressly disclaimed. American Polywater's only obligation shall be to replace such quantity of the product proven to be defective. Except for the replacement remedy, American Polywater shall not be liable for any loss, injury or damage, direct or indirect, arising from the use or the failure to properly use these products, regardless of the legal theory asserted.

Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ 3000 Software

American Polywater® Corporation

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Polywater®

FRONT END PACK™

CABLE LUBRICATING SYSTEM



Polywater® Front End Packs™ lubricate ahead of the cable during the pull. They eliminate the need for hand lubrication in many pulls. Proper Front End Pack™ use lubricates far down the conduit where normal lubrication is inadequate.

Sizes

Two different sizes; a 1-quart pack (J-27/J-99) and a 1/2-gallon pack (J-55/J-110) are available.

- The 1-quart pack is 1¾" in diameter by 24" long and is used in 2" and 3" conduit.
- The 1/2 -gallon pack is 3" in diameter by 14" long and is used in 3½" and larger conduit.

Package Size	Polywater® J Product #	Winter Grade Product #	Units/Case
1/2 –Gal Pack (bag)	J-110	WJ-110	10 Packs in a 5-gal Pail
1/2-Gal Pack (bag)	J-55	WJ-55	6 Packs in a Carton
1-Qt Pack (bag)	J-99	WJ-99	16 Packs in a 5-Gal Pail
1-Qt Pack (bag)	J-27	WJ-27	12 Pack in a Carton

Quantity Formula

When only Front End Packs™ are used for a pull, the number of packs recommended for a pull is:

N = 0.003 x T x L x D

N = Number of packs required

T = (1) for J-55/J-110 packs or (2) for J-27/J-99 packs

L = Length of pull in feet

D = Nominal I.D. of conduit in inches

The quantity appropriate for a difficult pull may be up to +50% above this average, depending on conduit fill, conduit type and condition, number of bends, and pulling environment.

To view technical information on our website go to:
Lubricant Application Videos: **www.polywater.com/videoslube.asp**
Written Instructions: **www.polywater.com/frontend.html**

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LIT-FEPFLYER/REV001

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Polywater® PJ

HIGH-PERFORMANCE CABLE LUBE



Polywater PJ being poured into a feeder tube

Pourable Cable Pulling Lubricant

PRODUCT BENEFITS

- **No Mess**: Pour or pump lubricant directly into the duct.
- **Low Viscosity:** Makes pouring lubricant cleaner, faster, and easier.
- **Easy to Pump:** Ensures proper lubrication during longer pulls.
- **Cold Weather Formula:** Lubricant can be used for year-round cable installations.
- **Quantity:** Use one gallon of lubricant per 100 feet of cable installed.

Pourable PJ is Perfect for Conduit Stub-Ups

Polywater® PJ offers the same high-performance factors as heavy duty Polywater® J. Polywater PJ matches Polywater J's high lubricity and lower cable tensions. Polywater PJ is the best choice for installations where pouring or pumping are more efficient methods of lubricant application.



Easy-to-handle gallon jugs



PJ is great for pumping

polywater.com | 651-430-2270

American Polywater® Corporation



Easy-pour package design

Field-Friendly Packaging—No More Handling the Lubricant

Polywater PJ can also be pumped using the LP-D5 drill-powered pump. Polywater PJ comes in two grades: Regular Grade (PJ) and Winter Grade (WPJ), for cold weather use in temperatures as low as -20°F (-30°C).

POLYWATER PJ

Catalog #	Package Description	Units/Case
PJ-128 / WPJ-128	1-gal. jug (3.8 liters)	4
PJ-320 / WPJ-320	2½-gal. jug (9.6 liters)	2
PJ-640 / WPJ-640	5-gal. pail (18.9 liters)	1
PJ-DRUM / WPJ-DRUM	55-gal. drum (208 liters)	1

*W in the catalog number indicates Winter Grade version.

SPECIFICATIONS AND APPLICATIONS:

- **Cable Compatibility:** Passes IEEE 1210 physical and electrical testing on a wide variety of cable materials. It does not stress crack polyethylene. Refer to the technical bulletin for details.
- **Friction Testing:** Shows excellent lubricity on a variety of cable jacket types. Using PVC conduit, the following COFs were measured: PVC .11, XLPE .11, LLDPE .11.
- **Physical Properties:** Dries slippery. It leaves little residue and won't cement cables into conduit.
- **Temperature Stability:** PJ is stable and will not separate after exposure to high heat or freezing.

CONTACT US

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Polywater®

Lubricant Pump

Model LP-D5



Use your ½-inch drill to pump pulling lubricant from a 5-gallon pail or a 55-gallon drum.

Now includes two hands-free applicators for ½ to 6-inch conduits.

The Polywater® Lubricant LP-D5 Pump is a ½-inch drill-operated, self-priming, gear pump. Now includes two hands-free applicators (small for 1½ to 3-inch and large for 3 to 6-inch conduits). All Polywater® lubricants can be pumped directly into the conduit or onto the cable during cable installations at rates exceeding 1.5 gallons per minute.

The LP-D5 pump sets directly onto a 5-gallon pail or 55-gallon drum and comes with a 10-foot discharge hose with lubricant applicator.

Advantages

- **Practical Transfer of all Polywater® Lubricants** – Save time and effort in cable pulling. Eliminate hand scooping, messy pouring, and lengthy clean-ups.
- **Variable Pumping Capability** – Adjustable speed ½-inch drill allows pump to deliver lubricants at a rate of 1.5 gallons per minute or higher.
- **Consistent Lubricant Application** – Automates lubricant application with consistent lubrication throughout installation.
- **Convenient** – No hand pumping. Requires battery or ½-inch electric variable speed drill.
- **Easy Maintenance** – Minimum assembly required. Cleans up with water.
- **Corrosion Resistant** – Solid brass body and stainless steel shaft.

Polywater® Lubricant LP-D5 Pump

Operation

For use on 55-gallon drum and 5-gallon pail Open pail or drum. With drum, untie and open liner, then replace drum cover. Set LP-D5 pump in 5-gallon pail or into the 2-inch bung hole of a 55-gallon drum. Attach variable speed drill to LPD5. Insert free end of hose into conduit opening, pail or jug. Set drill to OPERATE IN FORWARD. Start drill to pump lubricant until it is visible at hose end. If installing cable, start pulling cable and start variable speed $^{1/2}$-inch drill to pump lubricant at desired flow rate.

Cleaning

Pump clean tap water through LP-D5 pump until water discharge is clear. Let pump sit for 15 minutes. Run pump again with clean tap water to remove any remaining lubricant. Repeat the process as necessary. Wipe off pump and applicator. Protect from dirt with bag or other cover.

General

Keep dirt and debris away from pump to avoid damage. Avoid running pump dry to prevent damage.

Ordering Information

Catalog #	Description
LP-D5	Drill Powered pump for 5-Gallon Pail or 55-Gallon Drum. Includes 2 applicators (½-inch drill not included)

Suggested Polywater® Lubricants for pumping application:

Polywater® LZ Cable Pulling Lubricant: www.polywater.com/polylz.asp

Polywater® J Cable Pulling Lubricant: www.polywater.com/polyj.html

Polywater® PJ Pourable Cable Lubricant: www.polywater.com/polypj.html

To view technical information on our website go to:

Support Page: www.polywater.com/pumplpd5.asp

Application Videos: www.polywater.com/videos.asp

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Polywater® + Silicone™

CABLE PULLING LUBRICANT



Polywater + Silicone lubes are easily pumped

For Installing Transmission Cable, Pulling Through Water, and Lubricating HDPE Conduit Systems

PRODUCT BENEFITS

- **Heavy Pulls:** Preferred lubricant for URD and underground transmission cable installations.
- **Water Resistant:** Does not wash off. Reduces tension even when pulling through water.
- **Very Low Friction:** Consistently low friction and tension when pulling through HDPE and PVC pipe.
- **Non-Freezing Formula:** Polywater WNN and WNB can be used for cold weather (sub-freezing) pulling.
- **Roller Option Available:** Polywater NB contains small, friction-reducing roller balls.

The Longest Cable Pulls Made Simple

Polywater® + Silicone™ Types NN and NB are specification-grade cable pulling lubricants that demonstrate superior performance, particularly friction reduction in HDPE conduits and conduits containing water. These lubricants provide continuous lubrication on long pulls.



Easy-to-pour 2.5-gallon jugs



Great for residential URD installations

polywater.com | 651-430-2270

American Polywater® Corporation



Pouring lube into a conduit stub-up



Packaging designed to be poured

Numerous Package and Application Options

Polywater + Silicone is available with or without small plastic rollers in the lubricant. Type NB has the rollers and Type NN does not. In both Type NN and NB, a Regular Grade and Winter Grade (for cold weather use in temperatures as low as -20°F (-30°C)) are available. Polywater + Silicone can be pumped using the LP-D5 drill-powered pump, making it ideal for long-distance cable installations.

POLYWATER + SILICONE

Catalog #	Package Description	Units/Case
NN-128 / WNN-128	1-gal. jug (3.8 liters)	4
NN-320 / NA	2½-gal. jug (9.5 liters)	2
NN-640 / WNN-640	5-gal. pail (18.9 liters)	1
NN-DRUM / WNN-DRUM	55-gal. drum (208 liters)	1
NB-35 / WNB-35	1-qt. bottle (0.95 liter)	12
NB-128 / WNB-128	1-gal. jug (3.8 liters)	4
NB-320 / NA	2½-gal. jug (9.5 liters)	2
NB-640 / WNB-640	5-gal. pail (18.9 liters)	1
NB-DRUM / NA	55-gal. drum (208 liters)	1

*W in the catalog number indicates Winter Grade version.

SPECIFICATIONS AND APPLICATIONS:

- **Cable Compatibility:** Passes IEEE 1210 physical and electrical testing on a wide variety of cable materials. Cable manufacturer approvals available upon request.
- **Friction Testing:** Shows excellent lubricity on a variety of cable jacket types. Using HDPE conduit, the following COFs were measured: LLDPE .05, PVC .08, XLPE .07, CPE .08, PP .07. Method described in “Coefficient of Friction Measurement on Polywater’s Friction Table, 2007.” Typical values determined using 200 lbs./ft. normal force.
- **Coatability:** Polywater + Silicone NN will wet out evenly on cable jacket surfaces. Using the Telcordia test procedure TR-TSY-00356 Sections 4.1.3 and 4.1.4, a cable was subjected to 5 separate pulling cycles through a water-filled duct and the COF was measured showing excellent friction reduction and lubricant adherence to the cable.
- **Temperature Range:** Has a wide temperature use range: 20˚F to 120˚F (-5°C to 50°C). Polywater WNN/WNB (Winter Grade): -20°F to 120°F (-30°C to 50°C).

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American Polywater® Corporation

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Polywater® Plus Silicone™ NN Enhanced Lubricant

American Polywater® Corporation

TECHNICAL SPECIFICATION

Description:

Polywater® Plus Silicone™ NN Lubricant is a high-performance, specification-grade, cable pulling lubricant. Lubricant NN provides superior tension reduction and is suitable for all types of cable pulling. It has primarily been used for long pulls of heavy cable. In this type of pulling, its superior tension reduction and continued lubrication while pulling through water are well documented.

Polywater® Plus Silicone™ NN is suitable for use with factory lubricated duct. It continues to lubricate under high sidewall pressure forces in conduit bends. Lubricant NN is slow drying. The residue is a thin, slippery film that retains its slip for months after use.

Polywater® Plus Silicone™ NN is a semi-gel that pours thickly. While it can be applied by hand, it is best to pour or pump the lubricant into the duct system.



Friction Testing:

Lubricity: Polywater® Plus Silicone™ NN Lubricant shows superior friction reduction on a variety of jacket types. Typical friction coefficients at 200 lbs/ft (2.91 kN/m) normal pressure are shown. Test results are based on the method described in the white paper, "Coefficient of Friction Measurement on Polywater's Friction Table, 2007" (polywater.com/FTable.pdf). Values are averages based on cable jacket and conduit materials from multiple manufacturers.

Cable	Conduit			
Jacket	HDPE	PVC	Steel	FRP
LLDPE	.05	.11	.13	.13
PVC	.08	.09	.13	.10
CPE	.08	.10	.20	.15
XLPE	.07	.08	.13	.14
PP	.07	.05	.07	.10

Coefficient of friction data on additional or specific cable jackets or conduits came be obtained from American Polywater Corporation.

Product Benefits:

- Lubricates through water-filled duct
- Superior friction reduction
- Suitable for factory lubricated conduits
- Clean and non-staining
- Temperature stable
- Specification grade

End Use:

Suitable for all types of cable installations, including:

- Water-filled ducts
- Multiple bends, high sidewall pressure
- Heavy transmission cable
- Long underground pulls
- High conduit fill

Cable Compatibility:

Tensile and Elongation:
LLDPE, HDPE, PP, XLPE, CPE, and PVC cable jacket materials aged in Polywater® Plus Silicone™ NN per IEEE Standard 1210[1] meet the tensile and elongation retention requirements of that standard.

Polyethylene Stress Cracking:
Polywater® Plus Silicone™ NN shows no stress cracking on LLDPE, MDPE, or HDPE cable jacket when tested per IEEE Standard 1210[1].

Volume Resistivity:
There are no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when volume resistivity is tested according to IEEE Standard 1210[1].

Cable Approvals:
Polywater® Plus Silicone™ NN is approved and used by many cable manufacturers. Contact American Polywater for further information.

Field Data:
Polywater® Plus Silicone™ NN has been specified and used on many long, heavy cable installations. Side-by-side comparison pull tension data is available. Contact American Polywater for details.

[1] *IEEE Std 1210-2004; IEEE Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable.*

Physical Properties:

Property	Result
Appearance:	Cream-colored, thickly pourable gel
Wax and Grease Content:	None
Non-Volatile Solids (%):	3.5
VOC Content:	10 gms/L 200 gms/L (wintergrade)
Viscosity:	13,000 – 20,000 cps @10rpm
pH:	7.5 – 9.0

Performance Properties:

Coatability:
Coatability is a measure of the lubricant's ability to coat the jacket as a thin film for continued lubricity on longer pulls.

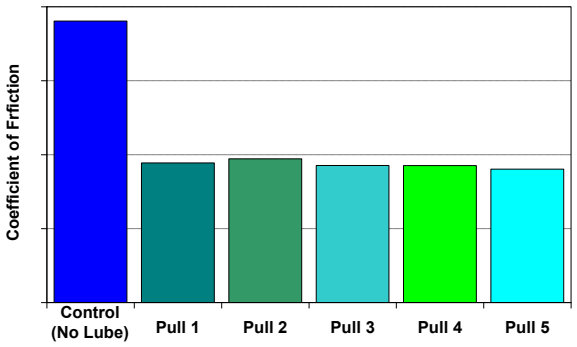
Polywater® Plus Silicone™ NN will wet out evenly on cable jacket surfaces. It will not bead up or rub off of the jacket sample. A one-inch (25 mm) diameter XLPE cable dipped six inches (152 mm) into the Polywater® Lubricant NN, then withdrawn and held vertically, will retain at least 15 grams of Polywater® Lubricant NN for one minute at 70° F (21° C).

Friction Reduction through Water:
Friction Reduction through Water is a measure of a lubricant's function through water.

Polywater® Plus Silicone™ NN will not show a significant increase in friction coefficient when tested with five water change cycles as described below.

A cable coated with Polywater® Plus Silicone™ NN Lubricant shall be pulled through HDPE duct wrapped 420° around a three-foot diameter cylinder[2]. The conduit shall be filled with tap water. Twenty-five pounds of back tension shall be put on the cable and the pulling tension measured and friction coefficient calculated as described in the Telcordia test procedure[2]. After each pull (cycle) the conduit shall be cleaned and the water changed. The same cable shall be used for the following cycle. The cable shall not be re-lubricated between cycles.

Polywater® Plus Silicone™ NN Water Cycle Test



Actual data from the test (above) shows no change in friction coefficient through five water change cycles.

[2] *Telcordia test procedure TR-TSY-00356 Sections 4.1.3 and 4.1.4*

Application Properties:

Application Systems:
Polywater® Plus Silicone™ NN Lubricant has a semi-gel consistency and can be thickly poured into the conduit or feeder tube.

Polywater® Plus Silicone™ NN can also be pumped directly into the conduit or onto the cable using the Polywater® LP-3 or LP-D5 specialty lubricant pumps. Pumps allow hands-free transfer and consistent application of lubricant. Polywater's low-shear pumps will not change the gel character of NN lubricant. The LP-3 and LP-D5 pumps support lubricant application rates of 1 to 3 gallons (4 to 11 liters) per minute.

Pull-Planner™ Tension Calculation Software is available from Polywater. Pulling tension estimations can ensure the use of appropriate pulling equipment and that the cable is installed within safe limits.

A wintergrade version (WNN) *is also available for use during installation work below freezing.*

Temperature Use Range:
Polywater® NN:
20° F to 120° F (-5° C to 50° C).
Polywater® WNN (wintergrade version):
-20° F to 120° F (-30° C to 50° C)

Temperature Stability:
Polywater® NN (or WNN) will not phase-out after five freeze/thaw cycles or 5-day exposure at 120°F (50°C).

Clean-Up:
Polywater® NN (or WNN) is non-staining. Complete clean-up possible with water.

Storage and Shelf Life:
Store Polywater® NN (or WNN) in a tightly sealed container away from direct sunlight. Lubricant shelf life is one year.

Directions for Use:

Polywater® Plus Silicone™ NN Lubricant can be poured or pumped directly onto the cable as it enters the conduit.

To prelubricate for long or difficult pulls, pour Polywater® Plus Silicone™ NN Lubricant into the conduit before the pull begins and spread with a mandrel or a swab on the winch line during the pull. For long horizontal pulls, place as much as two-thirds of the recommended quantity of lubricant into the conduit for prelubrication.

Directly lubricate the cable jacket as it enters the conduit for the entire length of the pull.

Clean-up by wiping off any excess lubricant with a rag.

Recommended Lubricant Quantity

$$Q = K \times L \times D$$

Where:
Q = quantity in gallons (liters)
L = length of conduit run in feet (meters)
D = ID of the conduit in inches (mm)
K = 0.0015 (0.0008 if metric units)

The quantity that is appropriate for any given pull can vary from this recommendation by 50%, depending on the complexity of the pull. Consider the following factors:

Cable weight and jacket hardness
(Increase quantity for stiff, heavy cable)

Conduit type and conditions
(Increase quantity for old, dirty, or rough conduits)

Conduit fill
(Increase quantity for high percent conduit fill)

Number of bends
(Increase quantity for pulls with several bends)

Pulling environment
(Increase quantity for high temperatures)

Model Specification:

The statement below may be inserted into a specific job specification to help maintain engineering standards and ensure project integrity.

The cable pulling lubricant shall be Polywater® Plus Silicone™ NN Lubricant. The cable pulling lubricant shall provide a low coefficient of friction on a wide variety of cable jacket materials. The lubricant shall leave a low solids residue of less than 4.0%.

The lubricant shall be compatible with the cable jacket material. Cable jacket compatibility shall be tested by the IEEE 1210, Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable. The lubricant shall not stress crack polyethylene per ASTM Standard 1693. There shall be no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when the lubricant's effect on volume resistivity is tested according to IEEE Standard 1210.

The lubricant shall not show a significant increase in friction coefficient over five water change cycles when tested through a water-filled duct via Telcordia test procedure TR-TSY-00356 Sections 4.1.3 and 4.1.4. The cable shall not be re-lubricated during the test.

Order Information:

Cat #	Package Description
	Regular
NN-35	1-quart squeeze bottle (.95 liter)
NN-128	1-gallon pail (3.78 liter)
NN-320	2 ½-gallon jug (9.6 liter)
NN-640	5-gallon pail (18.9 liter)
	Wintergrade
WNN-35	1-quart squeeze bottle (.95 liter)
WNN-128	1-gallon pail (3.78 liter)
WNN-320	2 ½-gallon jug (9.6 liter)
WNN-640	5-gallon pail (18.9 liter)

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Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ 3000 Software

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Polywater®

SPY

SPRAY CABLE LUBRICANT

Less Mess!

CONCENTRATED LUBRICANT TECHNOLOGY FOR PULLING OR PUSHING WIRE AND CABLE



Polywater® SPY Spray Lubricant offers an innovative approach to cable lubrication. The concentrated lubricant reduces pulling tension with only a thin coating. Use less with no need to "glop" on pasty wax lubricants. Just spray or wipe to coat the cable jacket. Quick and easy lubrication with no mess.

- Easy Spray or Wipe Application
- Lubricates With a Thin Film
- Works Even When Dry
- Non-Staining - Easy Clean-Up
- UL Listed
- Convenient Application Options

Usage Recommendations

POLYWATER® SPY LUBRICANT WORKS ON ALL TYPES OF JOBS.
LUBRICATE CABLE OR CONDUIT USING ONE OF THE APPLICATION OPTIONS.



Pre-Saturated Towels -- Catalog #SPY-D20

This lightweight and handy package fits easily into tool bags. Use the lubricant-saturated towels to coat the wires as they are pulled. The SPYD20 pop-up package contains 20 tough, non-tearing towels. A neat way to apply lubricant for runs up to several hundred feet.



Refillable Quart Trigger Sprayer -- Catalog #SPY-35LR

For small conduits, the trigger sprayer is a good way to apply the SPY Lubricant. The SPY-35LR quart bottle comes with an industrial-quality, high-volume spray trigger head. For short runs, you can even eliminate fishing by spraying Polywater® SPY and simply pushing the cables. The spray trigger package is reusable and can be refilled from gallon jugs.



Industrial Sprayer -- Catalog #IS-3

For larger installations, liquid Polywater® SPY Lubricant can be applied from a manually pressurized commercial sprayer. Polywater's Industrial Sprayer (IS-3) sprays up to 1/2 gallon per minute. This corrosion-resistant sprayer has a 3-gallon capacity poly container, an 18-inch curved brass extension, a 10-foot flexible heavy-duty hose, and a brass fan-spray nozzle.

Polywater® SPY Spray Lubricant Ordering Information

Package Size	Polywater SPY Product #	Winter Grade Product #	Units/Case
1-quart (.95 liter) bottle with sprayer	SPY-35LR	WSPY-35LR	12
1-gallon (3.8 liter) jug	SPY-128	WSPY-128	4
5-gallon (18.9 liter) pail	SPY-640	WSPY-640	1
20-count saturated wipe dispenser	SPY-D20	WSPY-D20	12
3-gallon (11.4 liter) capacity industrial sprayer	IS-3	IS-3	1

* See http://www.polywater.com/lubeinfo.asp for specific compatibility recommendations.

To view technical information on our website go to:
Support Page: **www.polywater.com/polyspy.asp**
Lubricant Application Videos: **www.polywater.com/videos.asp**

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Polywater® SPY Cable Lubricant

TECHNICAL SPECIFICATION

Description:

Polywater® SPY Spray Lubricant is a high performance, thin liquid cable pulling lubricant. Lubricant SPY is highly concentrated and works with only a thin coating. Polywater® SPY can be sprayed for easy application, yet has excellent cling and wetting to the cable. Lubricant SPY works even after it has dried. The residue is a thin, slippery film that retains lubricity for months after use.

Polywater® SPY Spray Lubricant is recommended for spray or wipe lubrication with no mess. The lubricant is suitable for all types of cable installations.

Innovation and Function:

Polywater® Lubricant SPY is a thin, concentrated liquid that can be sprayed into the duct or wiped on the cable. Industrial sprayers are available for automatic spraying application. Polywater® SPY is based on unique lubricant chemistry and technology. Much like a paint, the lubricant thins as it is sprayed or wiped. Once on the cable or conduit surface, it thickens to stay coated.

Polywater® SPY reduces friction effectively and compares favorably with the other high-quality Polywater® Lubricants. It has been successfully tested for a variety of uses:

- Lubricating fiberglass rods for easier and longer insertions during fishing.
- Spraying holes in wood studs to reduce tension in hand-pulled Romex wire.
- Eliminating need to fish by allowing shorter runs of wire to be pushed.
- Lowering tension on traditional building wire pulling into EMT or PVC conduits.
- Pressurized spraying for no-mess underground cable installation.



Product Benefits:

- Easy spray or wipe application
- Lubricates with a thin film
- Excellent friction reduction
- Continues to lubricate after drying
- Compatible with cable jackets
- Clean and non-staining
- Convenient

End Use:

Use for all types of cable installations, including:

- General construction
- Hands-free installations
- Automated spray application
- Cables with friction-enhanced jackets

Official Approvals:

UL and C-UL Approved

Cable Compatibility:

Polyethylene Stress Cracking:
Polywater® SPY shows no stress cracking on LLDPE cable jacket when tested per IEEE Standard 1210[1].

Tensile and Elongation Effects:
LLDPE, XLPE, and PVC cable jacket materials aged in Polywater® Lubricant SPY per IEEE Standard 1210[1] meet the tensile and elongation retention requirements of that standard.

Volume Resistivity:
There are no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when volume resistivity is tested according to IEEE Standard 1210[1].

Building Wire Testing:
THHN and XLPE building wire meet UL tensile, elongation, and voltage withstand requirements after exposure to Polywater® SPY Lubricant as tested by UL requirements[2].

Corrosivity:
Lubricant is non-corrosive to steel, copper, or aluminum. Passes UL 267[2] corrosion testing on zinc-coated EMT.

[1] *IEEE Std 1210-2004; IEEE Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable.*

[2] *UL Subject 267, Investigation for Wire-Pulling Compounds.*

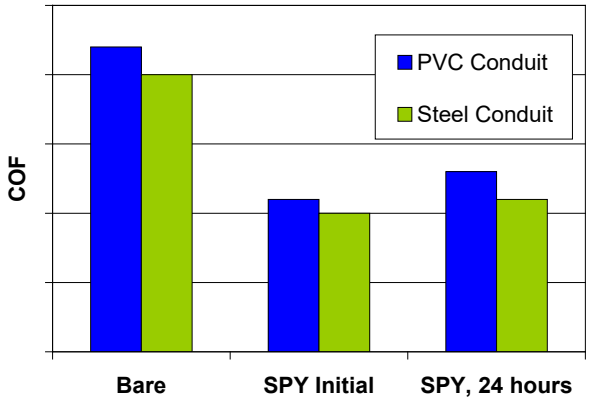
Physical Properties:

Property	Result
Appearance:	Slightly thickened, white liquid
Percent Non-Volatile Solids:	4%
VOC Content:	0 gms/liter
Viscosity:	250-750 cps @10rpm
pH:	7.5 – 9.0

Performance Properties

Dry lubrication
Dry lubrication measurements indicate the capability of thin-film lubricants to continue to lubricate when dry.

Polywater® SPY Lubricant continues to work even after it dries. Coefficient of friction values measured on cable coated and then dried for 24 hours are within 20% of the initial "wet" value. Measurements were done using the Friction Table Method described in the white paper, "Coefficient of Friction Measurement on Polywater's Friction Table, 2007." (polywater.com/FTable.pdf).



Wetting – Continuous Coat:
Wetting is a measure of the lubricant's ability to coat the jacket as a thin film for continued lubricity on longer pulls.

Polywater® SPY Lubricant will wet out evenly on cable surfaces. It will not bead up or rub off of the cable jacket. Lubricant will completely coat a one-inch diameter THHN or PVC-jacketed cable dipped six inches (152 mm) into the lubricant and then withdrawn after 10 seconds. The lubricant coating shall cover 100% of the immersed cable jacket without dripping off, non-wetting, or drawing back from the edges as the cable is held horizontally for one minute at 70° F (21° C).

Combustibility:
Lubricant has no flash point and dried residue is non-flammable.

Spraying Characteristics:
Low viscosity lubricant allows product to flow through airless spray heads. Lubricant will not clog valves or atomizers on the sprayer.

Application Properties:

Application Systems:
Polywater® SPY Lubricant can be applied in several unique and innovative ways. This thin liquid can be sprayed or wiped directly on the cable jacket. Shorter cable runs can be pushed once the cable is coated with Polywater® SPY. The slightly gelled character of Lubricant SPY helps it to coat and wet the cable for more difficult and complex cable pulls as well.

Wipe Application: For small cables, use the SPY-D20 towelette to wipe the lubricant on the cable jacket. This pre-saturated wipe lays down a thin, even coat of lubricant. The towel material will release the lubricant without a mess.

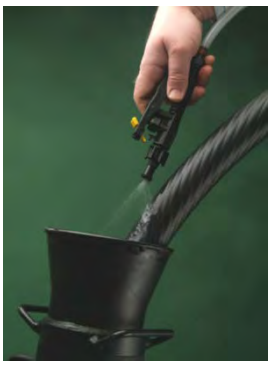
Trigger Spray Bottle: Use the trigger sprayer on the SPY-35LR bottle to spray Polywater® SPY Lubricant directly on the cable or into the conduit. The bottle can be refilled for multiple uses.

Pressurized Sprayer: For larger installations, apply Polywater® SPY Lubricant from a "pump-up" pressurized commercial sprayer (Cat #: IS-3). Spraying allows for the controlled and consistent, hands-free application of lubricant.

The IS-3 Sprayer can feed up to 0.5 gallon (2 liters) of lubricant per minute. This corrosion-resistant sprayer has a 3-gallon capacity poly container, an 18-inch curved brass extension, a 10-foot flexible heavy-duty hose, and a brass fan-spray nozzle.



Hand Wiping



Pressurized Spraying

Temperature Use Range:
Polywater® SPY:
20° F to 120° F (-5° C to 50° C).
Polywater® WSPY (wintergrade version):
-20° F to 120° F (-30° C to 50° C)

Temperature Stability:
No phase-out after five freeze/thaw cycles or 5-day exposure at 120° F (50° C). *Will not phase out or separate during the shelf life of lubricant.*

Clean-Up:
Non-staining. Complete clean-up is possible with water.

Storage and Shelf Life:
Store Polywater® SPY in a tightly sealed container away from direct sunlight. Lubricant shelf life is one year.

Directions for Use:

Polywater® SPY Lubricant can be sprayed or wiped directly onto the cable as it enters the conduit. Coat the entire cable jacket for best friction reduction.

For short runs, spray an appropriate amount of Polywater® SPY into the conduit before the pull, so the cable will pick up the lubricant as it is pulled.

Polywater® SPY leaves a light, clean residue. Any remaining residue will evaporate quickly.

Recommended Lubricant Quantity

$$Q = k \times L \times D$$

Where:

Q = quantity in gallons (liters)
L = length of conduit run in feet (meters)
D = ID of the conduit in inches (mm)
k = 0.0005 (0.0004 if metric units)

The appropriate quantity for use on any given pull can vary from this recommendation by 50%, depending on the complexity of the pull. Consider the following factors:

Cable weight and jacket hardness
(Increase quantity for stiff, heavy cable)
Conduit type and conditions
(Increase quantity for old, dirty or rough conduits)
Conduit fill
(Increase quantity for high percent conduit fill)
Number of bends
(Increase quantity for pulls with several bends)
Pulling environment
(Increase quantity for high temperatures

Model Specification:

The statement below may be inserted into a specific job specification to help maintain engineering standards and ensure project integrity.

The cable pulling lubricant shall be Polywater® Lubricant SPY. Lubricant has a sprayable viscosity and will not clog valves or applicators. It shall coat and cling to the cable. It shall be non-staining.

Lubricant shall produce a low coefficient of friction on a wide variety of cable jacket materials and shall lubricate at low coating thickness. Lubricant shall continue to reduce friction after it has dried. It shall conform to the physical and electrical requirements of IEEE 1210. It shall not contain solvents and shall not have a flash point.

No substitutions are permitted without certification from an officer of the manufacturer that the substitute product meets all of the requirements of this specification

Order Information:

Cat #	Package Description
	Regular
SPY-D20	20-count wipe canister
SPY-35LR	1-quart spray bottle (0.95 Liter)
SPY-128	1-gallon pail (3.78 Liter)
SPY-640	5-gallon pail (18.9 Liter)
	Wintergrade
WSPY-35LR	1-quart spray bottle (.95 Liter)
WSPY-128	1-gallon pail (3.78 Liter)
WSPY-640	5-gallon pail (18.9 Liter)

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Lit-SPYTech/REV000

Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ 3000 Software

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Polywater® CLR

CLEAR CABLE PULLING LUBRICANT



Quarts make application easy

Clear Lubricant for Electrical Applications

PRODUCT BENEFITS

- **Clean:** Wipes off easily so wire markers stick.
- **Water-Based Lubricant:** Non-staining—won't stain clothing, carpet, or sheetrock.
- **Reduces Friction:** Lowers tension on cable pulls.
- **Clings to Cable:** Easy to hand apply or squeeze out of bottles.
- **UL and ULC Listed:** Meets testing criteria.

Clear Lubricant for Everyday Cable Pulling

Polywater® CLR Clear Cable Pulling Lubricant is a clear, colorless, clean, slow-drying, easy-to-apply gel lubricant. This thick gel lubricant was developed to avoid drippage for easy handling and application.



Excellent cling factor



EMT, GRS, or PVC applications

polywater.com | 651-430-2270

American Polywater® Corporation



CLR packaging (drum not pictured)

Suitable for All Types of Cable Installations

Polywater CLR is a versatile lubricant for all types of wire and cable installations. From electrical service work to pulling in feeder cables, it provides a clean and easy way to finish projects.

POLYWATER CLR

Catalog #	Package Description	Units/Case
CLR-35	1-qt. bottle (0.95 liter)	12
CLR-128	1-gal. pail (3.8 liters)	4
CLR-640	5-gal. pail (18.9 liters)	1
CLR-DRUM	55-gal. drum (208 liters)	1

SPECIFICATIONS AND APPLICATIONS:

- **Cable Compatibility:** Passes IEEE 1210 physical and electrical testing on a wide variety of cable materials. It does not stress crack polyethylene.
- **Physical Properties:** Dries slippery. Unlike wax lubes, it leaves little residue and will not cement cables to conduit. Contains no wax, grease, or silicone.
- **Temperature Use Range:** 20°F to 120°F (-5°C to 50°C).
- **Temperature Stability:** No phase-out after five freeze/thaw cycles or 5-day exposure at 120°F (50°C).

CONTACT US

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1-651-430-3634 Fax

email: support@polywater.com

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Polywater® Dyna-Blue®

CABLE PULLING LUBRICANT



Dyna-Blue is easy to hand apply

Thick Gel Lubricant
Best for Hand Application

PRODUCT BENEFITS

- **Clean:** Non-staining gel lubricant. Won't stain clothing, carpet, or sheetrock.
- **Easy:** Can be applied by hand.
- **High Cling Factor:** Stays on wires during application. Will not cold flow.
- **Temperature Stable:** No ruined lubricant from freeze/thaw exposure.
- **Wipes Clean and Dry:** Wire markers stick to cable jackets.

Terrific for Vertical-Up Applications—Won't Cold Flow

Dyna-Blue® Lubricant is clean, dries slippery, and won't separate out. The thick gel is compatible with common electrical cables and has "clingability" for easy handling and application. It is a good lubricant for everyday use when installing THHN, XHHW, and fire alarm cables.



EMT, GRS, or IMC applications



Excellent choice for service work

polywater.com | 651-430-2270

American Polywater® Corporation



Dyna-Blue packaging (drum not pictured)

Packages to Meet Wire Installation Needs

Whether the pull is short or long, Dyna-Blue offers a package needed to get the job done. Polywater® Dyna-Blue Lubricant can also be pumped using the LP-D5 drill-powered pump.

POLYWATER DYNA-BLUE

Catalog #	Package Description	Units/Case
D-35	1-qt. bottle (0.95 liter)	12
D-128	1-gal. pail (3.8 liters)	4
D-640	5-gal. pail (18.9 liters)	1
D-DRUM	55-gal. drum (208 liters)	1

SPECIFICATIONS AND APPLICATIONS:

- **Cable Compatibility:** Passes IEEE 1210 physical and electrical testing on a wide variety of cable materials. It does not stress crack polyethylene.
- **Physical Properties:** Dries slippery. Unlike wax lubes, it leaves little residue and will not cement cables to conduit. Contains no wax, grease, or silicone.
- **Temperature Use Range:** 20° F to 120° F (-5° C to 50° C).
- **Temperature Stability:** No phase-out after five freeze/thaw cycles or 5-day exposure at 120° F (50° C).

CONTACT US

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email: support@polywater.com

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Dyna-Blue®
Heavy Duty Cable Lubricant

American Polywater® Corporation

TECHNICAL SPECIFICATION

Description:

Dyna-Blue® Cable Pulling Lubricant is a clean, slow-drying, easy-to-apply gel lubricant. This thick gel lubricant was developed with "clingability" for easy handling and hand application. Dyna-Blue® Lubricant is a good lubricant for everyday use in general electrical and communication applications.

Dyna-Blue® Lubricant is popular for commercial and institutional pulling because it is non-staining and easy to clean up in these environments.

Dyna-Blue® Cable Pulling Lubricant is slow drying. It effectively reduces friction and continues to lubricate for the full length of the pull. Its dried residue is non-conductive and non-combustible.

Dyna-Blue® Cable Pulling Lubricant is harmless to humans, environmentally safe, compatible with cable jacket materials and easy to handle.



Friction Testing:

Lubricity: Dyna-Blue® Lubricant shows good friction reduction across a broad class of jacket types. Typical values at 200 lbs/ft (2.91 kN/m) normal pressure are shown. Test results are based on the method described in the white paper, "Coefficient of Friction Measurement on Polywater's Friction Table, 2007" (polywater.com/FTable.pdf). Values are compiled from testing on multiple cable jacket and conduit materials from multiple manufacturers.

	Conduit Type		
Cable Jacket	EMT	PVC	Steel
XLPE	.18	.08	.18
LLDPE	.14	.11	.17
PVC	.11	.11	.19
CPE	.23	.21	.24
THHN	.23	.09	.21

Coefficient of friction data on additional or specific cable jackets or conduits can be obtained from American Polywater Corporation.

Product Benefits:

- Excellent cling for easy hand application
- Clean and non-staining
- Good friction reduction
- Compatible with cable jacket materials
- Temperature stable
- Combines effectiveness with economy

End Use:

Use for all types of cable installations, including:

- General electrical or communication use
- Overhead and vertical installations
- Indoor or building construction
- Heavy cable

Official Approvals:

UL Approved
CSA Listed

Cable Compatibility:

Tensile and Elongation Effects:
XLPE, LLDPE, VLDPE, PVC, CPE, and CSPE cable jacket materials aged in Dyna-Blue® Lubricant per IEEE Standard 1210[1] meet the tensile and elongation retention requirements of that standard.

Polyethylene Stress Cracking:
Dyna-Blue® Lubricant shows no stress cracking on LLDPE, MDPE, or HDPE cable jacket when tested per IEEE Standard 1210[1].

Volume Resistivity:
There are no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when volume resistivity is tested according to IEEE Standard 1210[1].

Building Wire Testing:
THHN and XLPE building wire meet UL tensile, elongation, and voltage withstand requirements after exposure to Dyna-Blue® Lubricant as tested by UL requirements[2].

Cable Approvals:
Dyna-Blue® Lubricant is approved by most cable manufacturers. Contact American Polywater for further information.

[1] *IEEE Std 1210-2004; IEEE Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable.*

[2] *UL Subject 267, Investigation for Wire-Pulling Compounds.*

Performance Properties:

Cling Factor:
Cling factor is a measure of the ability to apply the lubricant and have it stay on the jacket while the cable enters the conduit.

A six-inch length (152 mm) of a one-inch (25 mm) diameter cable will hold at least 75 grams of Dyna-Blue® Lubricant for one minute when held vertically at 70°F (21°C).

Coatability:
Coatability is a measure of the lubricant's ability to coat the jacket as a thin film for continued lubricity on longer pulls.

Dyna-Blue® Lubricant will wet out evenly on cable jacket surfaces. It will not bead up or rub off of the jacket sample. A one-inch (25 mm) diameter XLPE cable dipped six inches (152 mm) into the Dyna-Blue®, then withdrawn and held vertically, will retain at least 25 grams of Dyna-Blue® Lubricant for one minute at 70°F (21°C).

Combustibility: Lubricant has no flash point and dried residue is non-flammable.

Physical Properties:

Property	Result
Appearance:	Thick, light blue gel
Wax, Grease and Silicone Content:	None
Non-Volatile Solids (%):	3.0%
VOC Content:	0 gms/L
Viscosity:	70,000 – 110,000 cps @10rpm
pH:	6.5 – 8.5

Application Properties:

Application Systems:
Dyna-Blue® Lubricant has a thick gel consistency that makes it easy to hand apply.

Dyna-Blue® Lubricant can also be pumped directly into the conduit or onto the cable using the Polywater® LP-3 or LP-D5 specialty lubricant pumps. Pumps allow hands-free transfer and consistent application of lubricant. However, the thick gel consistency limits the length of the discharge hose and the pumping rate. The LP-3 supports Dyna-Blue® Lubricant application rates up to 0.9 gallon (3.5 liters) per minute and LP-D5 supports Dyna-Blue® Lubricant application rates of 0.1 to 0.3 gallon (0.4 to 1.2 liters) per minute.

Pull-Planner™ Tension Calculation Software is available from Polywater. Pulling tension estimations can ensure the use of appropriate pulling equipment and that the cable is installed within safe limits.

Temperature Use Range:
20° F to 120° F (-5° C to 50° C).

Temperature Stability:
No phase-out after five freeze/thaw cycles or 5-day exposure at 120° F (50° C).

Clean-Up:
Dyna-Blue® Lubricant is non-staining. Complete clean-up is possible with water.

Storage and Shelf Life:
Store Dyna-Blue® Lubricant in a tightly sealed container away from direct sunlight. Lubricant shelf life is one year.

Directions for Use:

Dyna-Blue® Lubricant can be squeezed, pumped or hand applied directly onto the wire or cable. The thick clingy gel character allows Dyna-Blue® to be applied to vertical installations. Conduit should be clean and continuous.

To prelubricate for long or difficult pulls, squirt a liberal amount of Dyna-Blue® Lubricant into the conduit before the pull begins and use a mandrel or a swab on the winch line to spread the lubricant during the pull.

Clean-up by wiping off any excess lubricant with a rag.

Recommended Lubricant Quantity

$$Q = k \times L \times D$$

Where:

Q = quantity in gallons (liters)
L = length of conduit in feet (meters)
D = ID of the conduit in inches (mm)
k = 0.0015 (0.0008 if metric units)

The quantity that is appropriate for any given pull can vary from this recommendation by 50%, depending on the complexity of the pull. Consider the following factors:

Cable weight and jacket hardness
(Increase quantity for stiff, heavy cable)

Conduit type and conditions
(Increase quantity for old, dirty or rough conduits)

Conduit fill
(Increase quantity for high percent conduit fill)

Number of bends
(Increase quantity for pulls with several bends)

Pulling environment
(Increase quantity for high temperatures)

Model Engineering Specification:

The statement below may be inserted into a specific job specification to help maintain engineering standards and ensure project integrity.

The cable pulling lubricant shall be Dyna-Blue® Lubricant. The cable pulling lubricant shall produce a low coefficient of friction on a wide variety of cable jacket materials. The lubricant shall be UL listed. It shall be easy to handle and adhere well to the cable.

The lubricant shall pass the IEEE 1210, Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable. It shall pass physical compatibility tests on LLDPE, XLPE, CPE, and PVC cable jacket or sheath materials. It shall not stress crack polyethylene per ASTM Standard 1693. There shall be no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when the lubricant's effect on volume resistivity is tested according to IEEE Standard 1210.

Order Information:

Cat #	Package Description
D-35	1-quart squeeze bottle (0.95 liter)
D128	1-gallon pail (3.78 liter)
D-640	5-gallon pail (18.9 liter)
D-Drum	55-gallon drum (208 liter)

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The statements contained herein are made in lieu of all warranties, express or implied, including, but not limited to, implied warranties of merchantability and fitness for a particular purpose, which warranties are hereby expressly disclaimed. American Polywater's only obligation shall be to replace such quantity of the product proven to be defective. Except for the replacement remedy, American Polywater shall not be liable for any loss, injury or damage, direct or indirect, arising from the use or the failure to properly use these products, regardless of the legal theory asserted.

Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ 3000 Software

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Polywater® CLR
Clear Cable Lubricant

American Polywater® Corporation

TECHNICAL SPECIFICATION

Description:

Polywater® CLR Clear Cable Pulling Lubricant is a clear, colorless, clean, slow-drying, easy-to-apply gel lubricant. This thick gel lubricant was developed with "clingability" for easy handling and application. Polywater® CLR Cable Pulling Lubricant is a good lubricant for everyday cable pulling of both electrical and communication cable.

Polywater® CLR Clear Cable Pulling Lubricant is popular for small cable installation in a commercial environment because it is non-staining and easy to clean up.

The dried residue of Polywater® CLR is non-conductive and non-combustible. Polywater® CLR Lubricant is harmless to humans, environmentally safe, compatible with cable jacket materials and easy to use.

Friction Testing:

Lubricity: Polywater® CLR Lubricant effectively reduces friction across a broad variety common of jacket types. Typical friction coefficients at 200 lbs/ft (2.91 kN/m) normal pressure are shown below. Test results are based on the method described in the white paper, "Coefficient of Friction Measurement on Polywater's Friction Table, 2007" (polywater.com/FTable.pdf). Values are compiled from testing on multiple cable jacket and conduit materials from multiple manufacturers.

	Conduit Type		
Cable Jacket	**EMT**	**PVC**	**Steel**
XLPE	.14	.11	.13
PVC	.11	.11	.13

Coefficient of friction data on additional or specific cable jackets or conduits can be obtained from American Polywater Corporation.



Product Benefits:

- Excellent cling for easy hand application
- Clear and colorless
- Clean and non-staining
- Good friction reduction
- Compatible with cable jacket materials
- Biodegradable
- Environmentally safe
- Non-toxic
- Temperature stable

End Use:

Suitable for all types of cable installations, including:

- General electrical and datacom installation
- Smaller wiring in upgrades
- Indoor construction

Official Approvals:

UL and C-UL Approved

Cable Compatibility:

Polyethylene Stress Cracking:
Polywater® CLR shows no stress cracking on LLDPE cable jacket when tested per IEEE Standard 1210[1].

Tensile and Elongation Effects:
PVC, LLDPE and XLPE cable jacket materials aged in Polywater® Lubricant CLR per IEEE Standard 1210[1] meet the tensile and elongation retention requirements of that standard.

Volume Resistivity:
There are no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when volume resistivity is tested according to IEEE Standard 1210[1].

Building Wire Testing:
THHN and XLPE building wire meet UL tensile, elongation, and voltage withstand requirements after exposure to Polywater® CLR Lubricant as tested by UL requirements[2].

Corrosivity:
Lubricant is non-corrosive to steel, copper, or aluminum. Passes UL 267[2] corrosion testing on zinc-coated EMT.

[1] *IEEE Std 1210-2004; IEEE Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable.*

[2] *UL Subject 267, Investigation for Wire-Pulling Compounds.*

Physical Properties:

Property	Result
Appearance:	Clear, colorless gel
Wax, Grease and Silicone Content:	None
Percent Non-Volatile Solids:	5%
VOC Content:	20 gms/liter
Viscosity:	40,000 – 60,000 cps @10rpm
pH:	6.5 – 8.0

Performance Properties

Cling Factor:
Cling factor is a measure of the ability to apply the lubricant and have it stay on the jacket while the cable enters the conduit.

A six-inch length (152 mm) of a one-inch (25 mm) diameter cable will hold at least 70 grams of Polywater® Lubricant CLR for one minute when held vertically at 70° F (21° C).

Coatability:
Coatability is a measure of the lubricant's ability to coat the jacket as a thin film for continued lubricity on longer pulls.

Material will wet out evenly on all surfaces. It will not bead up or rub off of the cable jacket. A one-inch (25 mm) diameter XLPE cable dipped six inches (152 mm) into the Polywater® Lubricant CLR, then withdrawn and held vertically, will retain at least 20 grams of Polywater® Lubricant CLR for one minute at 70° F (21° C).

Residue:
Residue is the percent solids remaining when the lubricant dries. A high residue can "cement" cables in place to prevent future removal or adjustment.

Polywater® CLR Lubricant has a low residue, less than 5% solids. The residue dries clear with no powders or discoloration. As Lubricant CLR dries, the product retains its lubricity.

Combustibility:
Lubricant has no flash point and dried residue is non-flammable.

Clarity:
Polywater® CLR Lubricant is completely clear and non-staining. All components are water soluble.

Application Properties:

Application Systems:
Polywater® CLR has a thick gel consistency that makes it easy to hand apply. The product will cling to the cable through vertical and long pulls.

The clear character of the lubricant and the low solids content make Polywater® CLR an ideal lube for installations where cleanliness is a concern.

Pull-Planner™ Cable Tension Calculation Software is available from Polywater. Pulling tension estimations can ensure the use of appropriate pulling equipment and that the cable is installed within safe limits.

Temperature Use Range:
20° F to 120° F (-5° C to 50° C).

Temperature Stability:
No phase-out after five freeze/thaw cycles or 5-day exposure at 140° F (60° C).

Clean-Up:
Polywater® CLR is non-staining. Complete clean-up is possible with water.

Storage and Shelf Life:
Store Polywater® CLR in a tightly sealed container away from direct sunlight. Lubricant shelf life is one year.

Directions for Use:

Polywater® CLR Lubricant can be squeezed, pumped or hand applied directly onto the wire or cable. The conduit should be clean and continuous.

To prelubricate for long or difficult pulls, squirt a liberal amount of Polywater® CLR Lubricant into the conduit before the pull begins and use a mandrel or a swab on the winch line to spread the lubricant during the pull.

Clean-up by wiping off excess lubricant with a rag.

Recommended Lubricant Quantity

$$Q = k \times L \times D$$

Where:
Q = quantity in gallons (liters)
L = length of conduit run in feet (meters)
D = ID of the conduit in inches (mm)
k = 0.0015 (0.0008 if metric units)

The quantity that is appropriate for any given pull can vary from this recommendation by 50%, depending on the complexity of the pull. Consider the following factors:

Cable weight and stiffness
(Increase quantity for stiff, heavy cable)

Conduit condition
(Increase quantity for old, dirty or rough conduits)

Conduit fill
(Increase quantity for high percent conduit fill)

Number of bends
(Increase quantity for pulls with several bends)

Pulling environment
(Increase quantity for high temperatures)

Model Specification:

The statement below may be inserted into a specific job specification to help maintain engineering standards and ensure project integrity.

The cable pulling lubricant shall be Polywater® CLR Lubricant. The lubricant shall be a clear, colorless thick gel that can be hand applied without dripping. The lubricant shall contain **no** waxes, greases, or silicones.

Cable jacket compatibility shall be tested by the IEEE 1210, Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable. It shall pass physical compatibility tests on PVC, LLDPE and XLPE cable jacket or sheath materials. It shall not stress crack polyethylene per ASTM Standard 1693. There shall be no significant changes in the conductive properties of XLPE semi-conducting compounds when the lubricant's effect on volume resistivity is tested according to IEEE Standard 1210.

Order Information:

Cat #	Package Description
CLR-35	1-quart squeeze bottle (0.95 Liter)
CLR-128	1-gallon pail (3.78 Liter)
CLR-640	5-gallon pail (18.9 Liter)

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Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ 3000 Software

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CableFree®

Loosener

A Revolutionary Cable Removal Aid

- **LOOSENS** stuck cables by softening binding agents such as wax, rust, soap, dirt, bitumen.
- **LUBRICATES** to minimize the force required to pull the cable out once it has broken free.
- **LEAVES** empty conduit undamaged and ready for reuse after cleaning and drying.
- **LOWERS** duct reclamation costs by eliminating expensive cut-ins.

CableFree® Loosener is designed to loosen and remove cables that are held in conduits by wax, rust, dirt, soap, or other adhesive residues. CableFree® Loosener will dissolve a great variety of binding agents. However, because of the large variety of causes of "stuck" cable, 100% success cannot be guaranteed.

The money saved by a successful removal of stuck cable(s) can be very high. Even a partial success rate can make the investment of time and effort worthwhile. The end-user must make this determination, however, based on the potential economic alternatives to any particular cable removal.

Limitations: The use of CableFree® Loosener is not intended to allow re-use of the cable being removed. The cable(s) being removed may be ruined by the solvent nature of the product and the high pulling forces required for removal.

Also, the removal of a single cable from a group of cables is usually not possible. All the cables in a conduit should be removed in bulk, and new cables installed.

ORDERING INFORMATION

Quantity: As a rule of thumb, one quart of CableFree® Loosener should be used for every 50 feet of 1" conduit (1 liter per 15 m of 2.5 cm conduit). For larger conduits, the following equation provides a starting estimate of the amount of Loosener for a particular cable removal.

Q=.02 x L x D
Metric Formula: Q = .024 x L x D

Q = quantity required in quarts *(liters for metric)*
L = length of the conduit in feet *(meters for metric)*
D = diameter of the conduit in inches *(centimeters for metric)*

Package Size	CableFree® Product #	Units/Case
5-gallon pail (18.9 liters)	CF-640	1
1-gallon jug (3.78 liters)	CF-128	4
1-quart bottle (0.95 liters)	CF-35	12

Use Procedure

Preparation

1. All circuits should be de-energized for safe operation. Do not work with liquid chemicals around live circuits. Critical switch gear, etc., should be covered and protected from spillage and drippage.

2. NOTE: Caution should be exercised when working with these liquid materials. Wear protective goggles and gloves at all times. Consult the material safety data sheets for more complete details.

Application

3. Fish a tape through the conduit system, if possible. Attach a sponge or a rag to the tape, sized to fit snugly in the conduit. If the conduit cannot be fished, see step 5.

4. Pour, pump, or squirt the appropriate quantity of CableFree® Loosener into the higher end of the conduit system. Spread the Loosener throughout the conduit by pulling the sponge or rag back and forth with the tape(s).

5. Another practical way to spread the Loosener is to use air pressure to "blow" it through the system. If only small amounts of CableFree® Loosener can be loaded at one time, alternate air blasts with doses of Loosener. For long segments, the Loosener can be blown in from both ends of the conduit.

6. The objective is to get the CableFree® Loosener to all points of the conduit so it can dissolve the binding materials. This may take several swab bull-throughs or air blasts, as well as some persistence.

7. If there are pull-through boxes with access, treat each segment separately, performing the procedure for each segment.

8. Place the cable puller, if required, at the optimal pulling location. For easier removal, the cable should be pulled out at the lower end of a vertical conduit system. It is also best to have any bends in the system as far away from the puller as possible. Attach a hydraulically crimped pulling eye or other strong fastening method to the cable conductors. Pull on the conductors (metal) to take advantage of their strength.

Removal

9. Once the CableFree® Loosener has been spread through the conduit, allow it to sit in the system as long as possible (for at least 2 but preferably 24 hours). The older the system, the longer the time required. For long waiting times or hot conduit systems, the conduit ends should be plugged with a rag to trap vapors inside. After waiting, attempt to free the cables by pulling on them. Twisting the cables in one direction can help break them free. Also, pulling on individual cables and breaking them free one at a time sometimes works.

10. If the cables fail to move, attach a hydraulic jack or try pulling from the opposite end. Raise and maintain high tension on the cables. Try pulling again after a 20-to-30 minute waiting period under tension. Increase tension and repeat steps, if necessary. Introduce "vibration" by hitting the tight cables with a pipe or bat. Such vibration can help break the cables free.

11. If the cable is still stuck, cut the conduit somewhere where it's accessible and try pulling the cables out from the middle. Repeat the loosening process with additional CableFree® Loosener, if necessary. Keep trying the procedures above until you break the cable free.

Clean-up

12. Once the cable is removed, pull a water-soaked rag through the conduit, then pull a drying swab back and forth until the conduit is dry. Blow air through the conduit until no CableFree® Loosener odor remains.

To view technical information on our website go to:
Support Page: **www.polywater.com/cablfree.html**
Application Videos: **www.polywater.com/videos.asp**

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Communications Cable Lubricants

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Polywater® CPL

CABLE PULLING LUBRICANT



Pouring Polywater CPL lubricant into a conduit

Pourable Universal Lubricant for Fiber Optic, Copper, Coax, and Power Supply Cables

PRODUCT BENEFITS

- **Superior Friction Reduction:** For lower tension cable pulls.
- **Easy to Apply:** Pours easily into innerducts and feeder tubes.
- **Compatible with Cable Jackets:** No cable jacket weakening or cracking issues.
- **Meets California CCR 22 Fathead Minnow Screen:** No disposal issues. Not a CA hazardous waste.
- **Wets Out and Covers PE Jackets:** Provides thorough lubrication on long pulls.

For Maximum Friction Reduction on Cable Pulls

Polywater® CPL is a high-performance, pourable cable pulling lubricant formulated specifically for the communications industry. It is recommended for long fiber optic, copper-paired, or coaxial cable pulls. CPL leaves a lubricating film after its water base has evaporated.



CPL-128 (1 gallon) poured into conduit



CPL applied using the LP-D5 pump

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American Polywater® Corporation



CPL family



WCPL family (Winter Grade)

Packages Designed for Pouring

Polywater CPL is available in two grades: Regular Grade CPL (*photo 1*) and Winter Grade WCPL (*photo 2*) for cold weather use in temperatures as low as -20°F (-30°C). The packages are all designed to allow the lubricant to be poured into upturned innerduct or a feeder tube.

POLYWATER CPL

Catalog #	Package Description	Units/Case
NA / WCPL-35	1-qt. (0.95-liter) bottle	12
CPL-128 / WCPL-128	1-gal. (3.8-liter) jug	4
CPL-320 / WCPL-320	2½-gal. (9.6-liter) jug	2
CPL-640 / WCPL-640	5-gal. (18.9-liter) pail	1

*W in the catalog number indicates Winter Grade version.

SPECIFICATIONS AND APPLICATIONS:

- **Lubricity:** LDPE-, MDPE-, and HDPE-jacketed cable on HDPE and PVC innerduct at 200 lbs./ft. (2.91 kN/m) sidewall force, coefficient of kinetic friction < 0.12.
- **Percent Non-Volatile Solids:** 4.5% to 5.5%.
- **Appearance:** Opaque-white stringy liquid. Pourable viscosity (1,000-3,000 cps @ 10 rpm).
- **pH:** Neutral (6.5-7.5).
- **Cable Compatibility:** No deleterious effects on physical or electrical properties of cable jackets.
- **Polyethylene Stress Cracking:** No stress cracking on LDPE cable jackets when tested by ASTM D1693.

CONTACT US

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email: support@polywater.com

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American Polywater® Corporation

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Polywater® Communication Pourable Lubricant Type CPL



POLYWATER® Lubricant CPL is a high performance, **pourable** liquid cable pulling lubricant formulated specifically for the communications industry. It is recommended for long fiber optic, copper or coaxial cable pulls.

POLYWATER® Lubricant CPL provides maximum friction reduction between cable and conduit under both low and high sidewall bearing pressures. It is slow-drying and leaves a lubricating film after its water base has evaporated. Polywater® CPL is a liquid lubricant and can be applied by pouring into an up-turned duct or funnel.

POLYWATER® Lubricant CPL meets California regulation CCR 22. Polywater® CPL is suitable for use on PE communication cable jackets.

Product Benefits

- High performance lubrication
- Superior friction reduction
- Effective lubrication when dry
- Lubricates cable for long distance - liquid clings to cable.
- Compatible with cable jackets—including polyethylene
- Pourable lubricant for easy underground application

Friction Testing

Friction is measured using a standard Telcordia test procedure[1]. HDPE duct is wrapped 420° around a three-foot-diameter cylinder. A variable "back tension" weight is attached to the cable and the cable is pulled through the wrapped duct at a speed of 65 ft/min. A load cell measures pulling force, which, combined with the "back tension", is used to calculate a friction coefficient. Results below are typical values.

Coefficient of Friction for MDPE Jacket Cable into HDPE Smoothwall Innerduct

	Condition		
Back Tension	Unlubricated	Initial	Dry
14 lb_f	>0.30	0.10	0.12
25 lb_f	>0.30	0.09	0.11

For the dry test, continuous, warm air was run through the conduit until the lubricant volatiles had evaporated (~1 hour). POLYWATER® Lubricant CPL shows good friction reduction even after drying. Dry coefficient of friction values are within 30% of initial value.

[1] *Telcordia Standard TR-NWT-002811, Section 4.1.3 and 4.1.4; Generic Requirements for Cable Placing Lubricants.*

Environmental Testing

POLYWATER® Lubricant CPL is safe in the aquatic environment and passes CCR Title 22 Fathead Minnow Hazardous Waste Screen Bioassay.

Product	Result
POLYWATER® Lubricant CPL:	PASS (LC_{50} > 750 mg/L)

Lubricant Properties

Appearance:
Opaque-white stringy liquid. Pourable viscosity (1,000 -3,000 cps @ 10rpm). Neutral pH (6.5 – 7.5).

Wetting – Continuous Coat:
Wetting is a measure of the lubricant's ability to completely coat the jacket for continued lubricity on longer pulls.

POLYWATER® Lubricant CPL will wet out evenly on cable jacket surfaces. It will not bead up or rub off of the cable jacket. Lubricant will completely coat a one-inch diameter PE-jacketed cable dipped six inches into the lubricant; then withdrawn within 10 seconds. The lubricant coating shall cover 80% of the cable jacket without dripping off, beading up, or pulling away from the edges as it is held horizontally for one minute at 70°F (21°C).

Polyethylene Stress Cracking:
POLYWATER® Lubricant CPL does not stress crack polyethylene jackets commonly used on communications cables. Untreated polyethylene (Union Carbide DYNK) and MDPE jacket material were both tested according to ASTM standard method.[2] After 168 hours exposure none of the test specimens showed failures.

[2] *ASTM Test Method D1693, Environmental Stress-Cracking of Ethylene Plastics.*

Combustibility:
Lubricant has no flash point and dried residue is non-flammable.

Temperature Use Range:

Communication Lubricant CPL:	Wintergrade Lubricant, WCPL
20°F to 120°F (-5°C to 50°C)	-20°F to 120°F (-30°C to 50°C)

Temperature Stability:
No more than a 20% change in Brookfield viscosity from 40°F to 100°F (5°C to 40°C). No phase-out after five freeze/thaw cycles or 5-day exposure at 120°F (50°C). *Will not separate during the shelf life of lubricant.*

Storage and Shelf Life:
Store tightly sealed, away from direct sunlight. Lubricant shelf life is one year past the date of manufacture.

Order Information

Cat #	Package Description
CPL-128	1-gallon pail (3.78 Liter) 4/case
CPL-320	2 ½- gallon jug (9.6 liter)
CPL-640	5-gallon pail (18.9 Liter)
	Wintergrade
WCPL-35	1-quart squeeze bottle (0.95 liter)
WCPL-128	1-gallon pail (3.78 Liter) 4/case
WCPL-320	2 ½- gallon jug (9.6 liter)

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Polywater® FTTx

CABLE PULLING LUBRICANT



Polywater FTTx applied into conduit

Quick-Drying Lubricant that Lowers Tension in Fiber Drops and Data Cable Pulls

PRODUCT BENEFITS

- **Superior Performance:** Reduces friction with ultra-thin coating levels.
- **Zero Mess:** Dries quickly and leaves no mess on the receiving side of the cable pull, unlike traditional wax or gel lubricants.
- **Low-Friction Residue:** Even lubricates when dry.
- **Spray or Wipe Application:** Efficient and easy to use.
- **Compatible with Cable Jackets:** Suitable for a variety of cable jacket types.

"Zero Mess" Friction Reduction on Cable Pulls

Polywater® FTTx Lubricant is a high-performance, silicone-based, liquid lubricant designed specifically for communication cable installations. When dried, FTTx leaves a thin, lubricating film on cables. There is no mess on the receiving end of pulls, which helps maintain a clean workspace.



FTTx-D20 dispenser with saturated wipes



FTTx applied to duct with a sprayer pump



Saturated FTTx wipe applied to cable



FTTx family

Sprayable Cable Lubricant

Polywater FTTx is a thin, sprayable liquid, available in several unique packages. The FTTx-35LR is a refillable quart bottle with a spray trigger, ideal for shorter cable installations. The FTTx-D20 contains lubricant-saturated towels that easily coat cable as it is pulled. For larger applications, FTTx can be sprayed with an air-pressurized industrial sprayer. FTTx is also available in a Winter Grade formula for cold weather use in temperatures as low as -20°F (-30°C).

POLYWATER FTTx

Catalog #	Package Description	Units/Case
FTTx-D20	20-count saturated wipe dispenser	12
FTTx-35LR/WFTTx-35LR	1-qt. (0.95-liter) bottle with sprayer	12
FTTx-128	1-gal. (3.8-liter) jug	4
FTTx-640	5-gal. (18.9-liter) pail	1

*W in the catalog number indicates Winter Grade version.

SPECIFICATIONS AND APPLICATIONS:

- **Viscosity:** 250-750 cps @ 10 rpm.
- **Combustibility:** FTTx has no flash point and dried residue is non-flammable.
- **Wetting—Continuous Coat:** FTTx will wet out evenly on cable jacket surfaces. It will not bead up or rub off the cable jacket.
- **High-Performance Data Cables:** FTTx has a minimal effect on the data-carrying capacity of high-speed Cat. 5E, 6, and 6A copper cable. As a “thin-film” lubricant, FTTx has no effect on cable signal attenuation.
- **Cable Compatibility:** Conforms to the physical and performance requirements of Telcordia Standard TR-NWT-002811, generic requirements for cable pulling lubricants.

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American Polywater® Corporation

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Polywater® FTTx Communications Lubricant

American Polywater® Corporation

TECHNICAL SPECIFICATION

Description:

Polywater® FTTx Lubricant is a high performance, liquid cable pulling lubricant designed specifically for communication cable installations. Lubricant FTTx is highly concentrated and works with only a thin coating. It can be sprayed or wiped for easy application, or poured into innerduct for long pulls. It has excellent cling and wetting, evenly coating the entire cable jacket surface. Lubricant FTTx works even after it has dried. The residue is a thin, slippery film that retains lubricity for months after use.

Polywater® FTTx Lubricant is recommended for quick and easy lubrication with no mess. The lubricant is suitable for all types of communication cable installations.

Friction Testing:

Friction is determined using a standard Telcordia test procedure[1]. The duct is wrapped 420° around a three-foot-diameter cylinder. A variable incoming weight is attached to the cable as it is pulled at a set rate of 65 feet per minute. A load cell takes pulling tension data which is used to determine a "dynamic" friction coefficient.

Coefficient of Friction for MDPE-Jacketed Cable on HDPE Continuous Innerduct

Back Tension	Wipe Application	Spray Application
8 lb_f	.09	.09
25 lb_f	.08	.07

[1] Telcordia Standard TR-NWT-002811, Section 4.1.3 and 4.1.4; Generic Requirements for Cable Placing Lubricants.



Product Benefits:

- Easy spray or wipe application
- Lubricates with a thin film
- Excellent friction reduction
- Performs after drying
- Compatible with cable jackets
- Clean and non-staining

End Use:

- Fiber optic drops (FTTx)
- High performance data cable
- Textile innerduct
- Long fiber pulls
- Long copper pulls

Performance Properties

Wetting – Continuous Coat:
Wetting is a measure of the lubricant's ability to coat the jacket as a thin film for continued lubricity on longer pulls.

Polywater® FTTx Lubricant will wet out evenly on all surfaces. It will not bead up or rub off of the cable jacket. Lubricant will completely coat a one-inch diameter PVC-jacketed cable dipped six inches into the lubricant; then withdrawn within 10 seconds. The lubricant coating shall cover 100% of the cable jacket without dripping off or pulling away from the edges as it is held horizontally for one minute (at 70°F).

Combustibility:
Lubricant has no flash point and dried residue is non-flammable.

Sprayability:
Low viscosity lubricant allows product to flow through spray head. Lubricant will not clog valves or atomizers.

Physical Properties:

Property	Result
Appearance:	Slightly thickened, white liquid
Percent Non-Volatile Solids:	3 %
VOC Content:	0 gms/liter
Viscosity:	250 – 750 cps @10rpm
pH:	6.5 – 8.0

Application Properties:

Temperature Use Range:
20°F to 120°F (-5°C to 50°C).

Temperature Stability:
No phase-out after five freeze/thaw cycles or 5-day exposure at 120°F (50°C). *Will not phase out or separate during the shelf life of lubricant.*

Clean-Up:
Non-staining. Complete clean-up with water.

Storage and Shelf Life:
Store tightly sealed, away from direct sunlight. Lubricant shelf life is one year past the date of manufacture.

Cable Compatibility:

Polyethylene Stress Cracking:
Polywater® FTTx does not cause environmental stress cracking of polyethylene jackets commonly found on communications cables. Untreated polyethylene (Union Carbide DYNK) and MDPE jacket material were both tested according to ASTM standard method.[1] After 168 hours exposure none of the test specimens showed failures.

Polycarbonate Stress Cracking:
Polywater® FTTx will not stress crack polycarbonate. Polycarbonate bars are bent to a defined strain and exposed to lubricant as described in the Telcordia standard[2], Section 8.2, Stress Cracking of Polycarbonate. After 48 hours, none of the test specimens showed signs of crazing or cracking.

Corrosion of Copper and Steel:
Polywater® FTTx will not corrode copper after 24-hour exposure as described in the Telcodia standard[2], Section 8.3, Copper Mirror Test.

[1] *ASTM Test Method D1693, Environmental Stress-Cracking of Ethylene Plastics.*

[2] *Telcordia Standard TR-NWT-002811; Generic Requirements for Cable Placing Lubricants.*

Directions for Use:

Polywater® FTTx Lubricant can be sprayed or wiped directly onto the cable as it enters the conduit. It may also be poured directly into duct.

For normal cable pulls, prelube the conduit by spraying five to ten squirts of pulling lubricant into the conduit before pulling. Saturate a wipe by spraying with lubricant and lightly wipe lubricant on jacket to fully coat the cable as it enters the conduit.

For lowest coefficient of friction, completely prelubricate the conduit. Squirt or pour appropriate amount of lubricant into the conduit and pull through a sponge or lubricant spreader to coat the interior of the entire length. Wipe lubricant on cables as they enter the conduit as described in above.

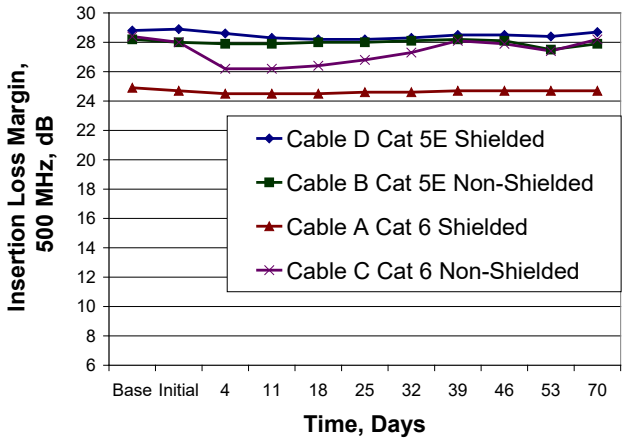
High efficiency spray pulling lubricants are effective with very thin coats in the range of 1 to 5 mg/cm^2 of jacket surface. See product usage section for lubricant quantity formulas.

Product Usage and Application Systems:

Polywater® FTTx Lubricant is innovative. It is intended for flexibility and ease in use. It is a very thin liquid that can be sprayed or wiped directly onto the cable jacket. Polywater® FTTx can be used to facilitate cable pushing for shorter installations. It can be poured or sprayed into conduit for longer, outside plant installations.

High Performance Data Cables:
Polywater® FTTx is recommended for high performance data cables. It has a minimal effect on the data carrying capacity of high speed, Cat. 5E, 6 and 6A copper cable. As a "thin-film" lubricant, FTTx has a limited effect on cable signal attenuation.

Data Cables in 100 ft., Closed Conduit



Polywater® FTTx shows dramatic friction reduction in data cable installations. Data cable pulled through EMT conduit with two 90° bends and a back tension of 14 lbs.

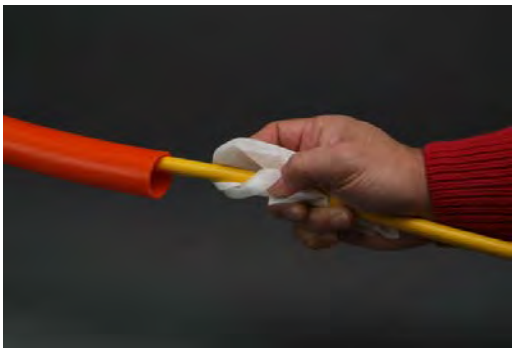
Coefficient of Friction
Data Cable in EMT Conduit

Unlubricated	.33
Polywater® FTTx	.10

Polywater® FTTx reduces friction by 70%.

For more information and full test results, please see *TIA Paper TR42.7, PN SP-3-0177, "The Effect of Lubricants on High Frequency Data Cables."*

The lubricant may be sprayed on a towel or an FTTx-D20 wipe can be used to efficiently apply the lubricant to the cable jacket. The pre-saturated wipe lays down a thin, even coat of lubricant. The towel material is specifically formulated to release lubricant without mess.



Wipe Application

Quantity Formula for High Performance Data Cables

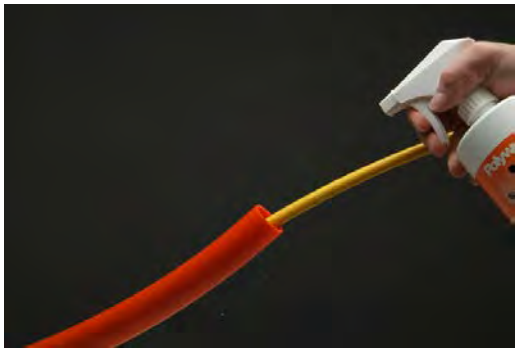
Q = 4 X n X D

Where:
Q = Quantity lubricant, fluid ounces per 100 ft
n = Number of cables in conduit
D = Average cable diameter in inches

Approximate quantity will vary by complexity of pull and field conditions.

Cable Pushing and Fiber Drops:
Polywater® FTTx Lubricant eases short installations of fiber where the fiber is pushed up to 300 feet. It effectively lowers friction so that the cable can be pushed farther distances, eliminating the need to blow or rod in pulling tapes.

The FTTx-35LR comes with an easy application trigger sprayer. The trigger head is industrial-quality, high volume. Use this package to apply FTTx Lubricant directly to the cable or to inject into conduit.



Spraying Action

Note: A high-volume trigger sprayer injects one fluid ounce per 20 sprays.

Product Usage and Application Systems:

Textile Innerduct:
Proven to reduce friction on these specialty fabrics, Polywater® FTTx Lubricant is perfect for use with textile innerducts. FTTx is directly applied to cable, dramatically lowering friction.

Friction is determined using a modification of Telcordia test procedure[1]. In this test, a fabric inner duct is placed inside a continuous HDPE conduit. The MDPE-jacketed cable is lubricated with Polywater® FTTx and pulled through a fabric cell.

Coefficient of Friction in MaxCell™ Fabric Innerduct

Back Tension	Polywater® FTTx Wipe
25 lb_f	.08

[1] Telcordia Standard TR-NWT-002811, Section 4.1.3 and 4.1.4; Generic Requirements for Cable Placing Lubricants.

MaxCell is a trademark of The MaxCell Group, Wadsworth, OH

Polywater® FTTx doesn't leak or squeeze into neighboring cells, causing them to seal shut. Use of a "thin-film" lubricant such as FTTx is ideal for this end use.

Prelubricated Duct:
Polywater® FTTx Lubricant is compatible with prelubricated duct.

Traditional Outside Plant Cable Installation:
For traditional cable installations, Polywater® FTTx Lubricant can be pumped, poured or sprayed into the innerduct.

Quantity Formula for Fiber Cable Installation

Q = K X L X D

Where: Q = Quantity of lubricant gallons (liters)
L = Length of conduit in feet (meters)
D = Cable diameter in inches (mm)
K = .00038 (.0002 if metric)

Appropriate quantity for use on any given pull can vary from this recommendation by 50%, depending on complexity. Adjust the volume of pulling lubricant based on cable stiffness, conduit type and condition, conduit fill, and pulling environment.

Model Specification:

The statement below may be inserted into a specific job specification to help maintain engineering standards and ensure project integrity.

The cable pulling lubricant shall be Polywater® Lubricant FTTx. Lubricant has a low viscosity that may be sprayed without clogging valves or applicators. It shall coat and cling to the cable. It shall be non-staining. Lubricant shall produce a low coefficient of friction on communication cable jacket materials and shall lubricate at low coating thickness. Lubricant shall continue to reduce friction after it has dried. It shall conform to the physical and performance requirements of Telcordia Standard, TR-NWT-002811, Generic Requirements for Cable Placing Lubricants. It shall have a limited effect on data cable signal attenuation. It shall not contain solvents and shall not have a flash point.

No substitutions are permitted without certification from an officer of the manufacturer that the substitute product meets all of the requirements of this specification

Order Information:

Cat #	Package Description
FTTx-D20	20-ct wipe canister 12/case
FTTx-35LR	1-quart spray bottle (.95 Liter) 12/case
FTTx-128	1-gallon pail (3.78 Liter) 4/case
FTTx-640	5-gallon pail (18.9 Liter)
FTTx-35 *(Special Order)*	1-quart bottle (.95 Liter) 12/case

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Polywater® CGL

CABLE PULLING LUBRICANT



Hand applying Polywater CGL lubricant

Universal Pulling Lubricant for Fiber Optic, Copper, Coax, and Power Supply Cables

PRODUCT BENEFITS

- **UL and CSA Listed:** Can be used where inspection is required.
- **Superior Friction Reduction:** Maximum tension reduction on all types of cable jackets.
- **High Cling Factor:** Clings to jacket for better lubrication on long runs.
- **Meets California CCR 22 Fathead Minnow Screen:** No disposal issues. Not a CA hazardous waste.
- **Compatible with Cable Jackets:** Compatible with PE and low-smoke zero-halogen (LSZH) communication cable jackets.

For Maximum Friction Reduction on Cable Pulls

Polywater® CGL is a high-performance, gel cable pulling lubricant formulated specifically for the communications industry. CGL is recommended for long fiber optic, copper-paired, or coaxial cable pulls. CGL provides maximum friction reduction between cable and conduit.



CGL-55 Front End Pack



CGL pumped into duct using an LP-D5 pump

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American Polywater® Corporation



CGL-35 applied to cable


CGL family

Universal Gel Lubricant

Polywater CGL is available in two grades: Regular Grade CGL and Winter Grade WCGL for cold weather use in temperatures as low as -20°F (-30°C). Polywater CGL can be hand applied, pumped into conduit using the LP-D5 drill-powered pump, or applied with Polywater's Front End Pack™. These lubricant bags are pulled through a conduit at the "front end" of a cable pull to prelubricate the cables.

POLYWATER CGL

Catalog #	Package Description	Units/Case
CGL-35 / WCGL-35	1-qt. (0.95-liter) bottle	12
CGL-128 / WCGL-128	1-gal. (3.8-liter) jug	4
CGL-640 / WCGL-640	5-gal. (18.9-liter) pail	1
CGL-27	1-qt. (0.95-liter) Front End Pack in a carton	12
CGL-99	1-qt. (0.95-liter) Front End Pack in a 5-gal. pail	16
CGL-55	½-gal. (1.9-liter) Front End Pack in a carton	6
CGL-110	½-gal. (1.9-liter) Front End Pack in a 5-gal. pail	10

*W in the catalog number indicates Winter Grade version.

SPECIFICATIONS AND APPLICATIONS:

- **Appearance:** Opaque-white stringy gel. Light gel viscosity (35,000-50,000 cps @ 10 rpm).
- **Combustibility:** CGL has no flash point and dried residue is non-flammable.
- **Coatability:** CGL will wet out evenly on cable jacket surfaces. It will not bead up or rub off the cable jacket. A 1-inch diameter XLPE cable dipped 6 inches into CGL and then withdrawn and held vertically will retain at least 25 grams of CGL for 1 minute at 70°F.
- **Cable Compatibility:** No deleterious effects on physical or electrical properties of cable jackets.
- **Polyethylene Stress Cracking:** No stress cracking on LDPE cable jackets when tested by ASTM D1693.

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Polywater® Communication Gel Lubricant Type CGL



POLYWATER® Lubricant CGL is a high performance, **gel** cable pulling lubricant formulated specifically for the communications industry. It is recommended for fiber optic, copper or coaxial cable pulls.

POLYWATER® Lubricant CGL provides maximum friction reduction between cable and conduit under both low and high sidewall bearing pressures. It is slow-drying and leaves a lubricating film after its water base has evaporated. Polywater® CGL is a gel material and can be applied by hand or using Polywater's LP Pumps.

POLYWATER® Lubricant CGL meets California regulation CCR 22. Polywater® CGL is suitable for use on PE and low-smoke zero-halogen (LSZH) communication cable jackets.

Product Benefits

- Superior friction reduction
- Effective lubrication when dry
- High cling factor
- Compatible with cable jackets—including fire-rated, plenum
- Clean and non-staining

Friction Testing

Friction is measured using the method described in the white paper, "Coefficient of Friction Measurement on Polywater's Friction Table, 2007" (polywater.com/FTable.pdf). Values are averages based on cable jacket and conduit materials from multiple manufacturers. Typical friction coefficients at 200 lbs/ft (2.91 kN/m) normal pressure are shown.

Coefficient of Friction for POLYETHYLENE Jacket Cable

Conduit Type	Typical Value
HDPE	.04
PVC	.05

Environmental Testing

POLYWATER® Lubricant CGL is safe in the aquatic environment and passes CCR Title 22 Fathead Minnow Hazardous Waste Screen Bioassay.

Product	Result
POLYWATER® Lubricant CGL:	PASS (LC_{50} > 750 mg/L)

Compatibility

Polyethylene Stress Cracking:
POLYWATER® Lubricant CGL does not stress crack polyethylene jackets commonly used on communications cables. MDPE and HDPE jacket materials were tested according to ASTM standard method[2]. After 168 hours exposure none of the test specimens showed failures.

[2] *ASTM Test Method D1693, Environmental Stress-Cracking of Ethylene Plastics.*

Properties

Appearance:
Opaque-white stringy gel. Light gel viscosity (35,000 -50,000 cps @ 10rpm). Neutral pH (6.5 – 7.5).

Coatability:

Coatability is a measure of the lubricant's ability to coat the jacket as a thin film for continued lubricity on longer pulls.

POLYWATER® Lubricant CGL will wet out evenly on cable jacket surfaces. It will not bead up or rub off of the jacket sample. A one-inch (25 mm) diameter XLPE cable dipped six inches (152 mm) into Polywater® Lubricant LZ, then withdrawn and held vertically, will retain at least 25 grams of Polywater® Lubricant LZ for one minute at 70° F (21° C).

Combustibility:
Lubricant has no flash point and dried residue is non-flammable.

Temperature Use Range:

Communication Gel Lubricant CGL:	Wintergrade Lubricant, WCGL
20°F to 120°F (-5°C to 50°C)	-20°F to 120°F (-30°C to 50°C)

Temperature Stability:
No phase-out after five freeze/thaw cycles or 5-day exposure at 120°F (50°C). *Will not phase out or separate during the shelf life of lubricant.*

Clean-Up:
Non-staining. Complete clean-up with water.

Storage and Shelf Life:
Store tightly sealed, away from direct sunlight. Lubricant shelf life is one year past the date of manufacture.

Order Information

Cat #	Package Description
CGL-27	1-quart bag (0.95 liter)
CGL-35	1-quart squeeze bottle (0.95 liter)
CGL-55	½-gallon bag (1.9 liter)
CGL-128	1-gallon pail (3.78 Liter) 4/case
CGL-640	5-gallon pail (18.9 Liter)
	Wintergrade
WCGL-128	1-gallon pail (3.78 Liter) 4/case

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Polywater® F

FIBER OPTIC CABLE PULLING LUBRICANT



Polywater F poured into conduit

For Pulling Fiber Optic and Other Communications Cable

PRODUCT BENEFITS

- **Superior Friction Reduction:** For lower tension and/or longer cable pulls.
- **Wets Out and Coats PE Jackets:** Lubricates at all points of cable rub on long pulls.
- **Pourable:** Can be poured into innerducts and feeder tubes.
- **Compatible with Cable Jackets:** Avoid weakened or cracked cable jackets.
- **Slow Drying:** Leaves a lubricious residue for lasting lubrication.

Pourable Lubricant Reduces Friction on Cable Pulls

Polywater® F Lubricant is a high-performance, pourable liquid ideal for pulling underground fiber optic cable. It is also suitable for pulling coaxial and copper-pair cable. Polywater F wets and clings to cable jackets while evenly coating the surface. Dries slowly while leaving a lubricating film.



F-320 2½-gallon jug



F applied to duct with an LP-D5 pump

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American Polywater® Corporation



F-128 (1 gallon jug) poured in conduit



WF (Winter Grade) family

A Lubricant that is Packaged to Pour

Polywater F is available in two grades: Regular Grade F and Winter Grade WF (*photo 2*) for cold weather use in temperatures as low as -20°F (-30°C). Polywater F can be hand poured or pumped into conduit using the LP-D5 drill-powered pump. The packages (with the exception of the 55-gallon drum) are designed to be poured into upturned innerduct or a feeder tube.

POLYWATER F

Catalog #	Package Description	Units/Case
F-35 / WF-35	1-qt. (0.95-liter) bottle	12
F-128 / WF-128	1-gal. (3.8-liter) jug	4
F-320 / WF-320	2½-gal. (9.6-liter) jug	2
F-640 / WF-640	5-gal. (18.9-liter) pail	1
F-DRUM / WF-DRUM	55-gal. (208-liter) drum	1

*W in the catalog number indicates Winter Grade version.

SPECIFICATIONS AND APPLICATIONS:

- **Lubricity:** LDPE-, MDPE-, and HDPE-jacketed cable on HDPE and PVC innerduct at 200 lbs./ft (2.91 kN/m) sidewall force, coefficient of kinetic friction <0.12.
- **Appearance:** Transparent to slightly opaque, orange-colored, stringy liquid material.
- **Temperature Stability:** No more than a 20% change in Brookfield viscosity from 40°F to 100°F (5°C to 40°C). No phase-out after five freeze/thaw cycles or 5-day exposure at 140°F (60°C).
- **Cable Compatibility:** No deleterious effects on physical or electrical properties of cable jackets.
- **Polyethylene Stress Cracking:** No stress cracking on LDPE cable jackets when tested by ASTM D1693.
- **Flammability:** Lubricant has no flash point and dried residue is not combustible.

CONTACT US

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email: support@polywater.com

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American Polywater® Corporation

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Polywater® F Communications Lubricant

American Polywater® Corporation

TECHNICAL SPECIFICATION

Description:

Polywater® F Lubricant is a high performance, pourable liquid, cable pulling lubricant recommended for pulling underground fiber optic cable. Polywater® F is also suitable for pulling coaxial and copper-pair cable.

Polywater® F wets and clings to cable jacket and evenly coats the jacket surface. It continues to lubricate by leaving a lubricating film after its water base has evaporated. Lubricant F is compatible with a broad range of cable jackets, including polyethylene types.

Polywater® F is a thick liquid, and is applied by pouring or pumping the lubricant into the duct system. F is a popular lubricant and used in the pulling over 50,000 miles (80,000 km) of fiber optic cable into duct.

Friction Testing:

Friction is measured using a standard Telcordia test procedure[1]. HDPE duct is wrapped 420° around a three-foot-diameter (0.91 m) cylinder. A weight is attached to the back of the test cable (variable back tension). Pulling force is measured as the cable is pulled at 65 ft/min (19.8 m/min) through the wrapped duct. A friction coefficient is calculated from the pulling force/back tension ratio. Results below are typical values.

Coefficient of Friction for Communication Cable into HDPE Smoothwall Innerduct

Back Tension	Cable Jacket		
	MDPE	HDPE	PVDF
8 lb_f	.10	.12	.10
14 lb_f	.10	.12	.09
25 lb_f	.10	.11	.09

Polywater® F Lubricant shows good friction reduction for these common cable jackets at both high and low bend shear.

[1] *Telcordia Standard TR-NWT-002811, Section 4.1.3 and 4.1.4; Generic Requirements for Cable Placing Lubricants.*



Product Benefits:

- Field proven performance
- Easy to pour into innerducts and feeder tubes
- Approved and recommended by many cable manufacturers
- Superior friction reduction
- Carries with cable for long distance - wets and clings to cable.
- Compatible with cable jackets
- Clean and non-staining

End Use:

Use for all types of cable installations, including:

- Outside plant cable pulls
- Underground cable installation
- Lightweight cable, long-haul installation

Performance Properties

For fiber pulling, special pulling lubricants are required for the long lengths and significant duration of the pulls. Lightweight fiber cable can rub on both the top and bottom of the duct, so the lubricant must completely coat the cable jacket and stay evenly coated. The lubricant must remain slippery over time, and not dry to a hard or sticky residue.

Wetting – Continuous Coat:
Wetting is a measure of the lubricant's ability to coat the jacket for continued lubricity on longer pulls.

Polywater® F Lubricant will wet and coat evenly on jacket surfaces. A half-inch (13 mm) diameter PE-jacketed cable shall be dipped six inches (152 mm) into Polywater® F Lubricant for 10 seconds and then removed. The lubricant coating shall cover 100% of the cable jacket without dripping off, beading up, or pulling away from the edges as the cable is held horizontally for one minute at 70° F (21° C).

Stringy Rheology:
"String" character is a measure of the lubricant's pituity and its ability to adhere, follow and stay with cable over long distances.

A ¼-inch (6 mm) fiber cable (MDPE jacket) dipped two inches (50 mm) into Polywater® F Lubricant and then pulled out at a 40 inches/minute rate (100 cm/min) will produce a non-supported, lubricant string length greater than 8 inches (20 cm) .

Pourability:
Pourability is a measure of the lubricant's ease of pouring.

Five gallons (18.9 l) of Polywater® F Lubricant will empty from a Reike® spouted 5-gallon pail in less than 90 seconds (no air relief) and in less than 60 seconds with air relief.

Combustibility:
Polywater® F Lubricant has no flash point and its dried residue is not flammable.

Physical Properties:

Property	Result
Appearance:	Orange-colored, stringy liquid
Percent Non-Volatile Solids:	< 5 %
VOC Content:	60 gms/liter 260 gms/liter (wintergrade)
Viscosity:	1,000 – 3,000 cps @10rpm
pH:	8.0 – 9.5

Application Properties:

Temperature Use Range:
Polywater® F:
20° F to 140° F (-5° C to 60° C).
Polywater® WF (wintergrade version):
-20°F to 140°F (-30° C to 60° C).

Temperature Stability:
Polywater® F will not show more than a 20% change in Brookfield viscosity from 40° F to 100° F (5° C to 40° C). Polywater® F will not phase-out after five freeze/thaw cycles or 5-day exposure at 120° F (50° C). Polywater® F will not phase out or separate over the shelf life of the lubricant.

Clean-Up:
Polywater® F is non-staining. Complete clean-up is possible with water.

Storage and Shelf Life:
Store Polywater® F in a tightly sealed container away from direct sunlight. Lubricant shelf life is one year.

Cable Compatibility:

Polyethylene Stress Cracking:
Polywater® F does not cause stress cracking of polyethylene jackets commonly used on communications cables.

Cable jacket polyethylene blends were tested according to ASTM ESCR standard method.[1]

DFDA 0588 Low density polyethylene
DFDA 6049 Linear low density polyethylene
DHDA 6497 Medium density polyethylene
DGDJ 3479 High density polyethylene
MDPE Stripped Cable Jacket

After 500 hours immersion in Polywater® F none of the specimens showed failures.

Polycarbonate Stress Cracking:
Polywater® F does not stress crack polycarbonate. Polycarbonate bars were bent to a defined stress and exposed to Polywater® F lubricant as described in the Telcordia standard[2], Section 8.2, Stress Cracking of Polycarbonate". After 48 hours, none of the test specimens showed crazing or cracking.

[1] ASTM Test Method D1693, Environmental Stress-Cracking of Ethylene Plastics.
[2] Telcordia Standard TR-NWT-002811; Generic Requirements for Cable Placing Lubricants.

Directions for Use:

Polywater® F can be poured or pumped directly into the conduit before and during the pull. Coat the entire cable as it enters the conduit.

Polywater® F can be pumped with the Polywater® LP-D5 specialty lubricant pump. Pumping allows hands-free transfer and consistent application of lubricant.

Clean up by wiping off any excess lubricant with a rag.

Recommended Lubricant Quantity

Q = k X L X D

Where:

Q = quantity in gallons (liters)
L = length of conduit run in feet (meters)
D = ID of the conduit in inches (mm)
k = 0.0015 (0.0008 if metric units)

The quantity that is appropriate for any given pull can vary from this recommendation by 50%, depending on the complexity of the pull. Consider the following factors:

Cable weight and stiffness
(Increase quantity for stiff, heavy cable)

Conduit condition
(Increase quantity for old, dirty or rough conduits)

Conduit fill
(Increase quantity for high percent conduit fill)

Number of bends
(Increase quantity for pulls with several bends)

Pulling environment
(Increase quantity for high temperatures)

Model Specification:

The statement below may be inserted into a specific job specification to help maintain engineering standards and ensure project integrity.

The cable pulling lubricant shall be Polywater® Lubricant F. The lubricant shall contain no waxes, greases, silicones, or waxes.

The lubricant shall be a pourable liquid with good wetting (coating) properties. It shall have a friction coefficient less than 0.15 using MDPE-jacketed cable and HDPE innerduct.

The lubricant shall conform to the physical and performance requirements of Telcordia Standard, TR-NWT-002811, “Generic Requirements for Cable Placing Lubricants”. It shall not stress crack polyethylene when tested by ASTM 1693. .

No substitutions are permitted without certification from an officer of the manufacturer that the substitute product meets all of the requirements of this specification

Order Information:

Cat #	Package Description
	Regular
F-35	1-quart squeeze bottle (0.95 liter)
F-128	1-gallon jug (3.78 liter)
F-320	2 ½- gallon jug (9.5 liter)
F-640	5-gallon pail (18.9 liter)
	Wintergrade
WF-35	1-quart squeeze bottle (0.95 liter)
WF-128	1-gallon jug (3.78 liter)
WF-320	2 ½- gallon jug (9.5 liter)
WF-640	5-gallon pail (18.9 liter)

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Polywater®

Prelube

Cable Blowing Lubricants for Air-Assisted Installation of Fiber Cable

Lower Friction and Increase Blowing Distance



Prelube 2000™

for blowing conventional fiber optic cable

Easy to Apply

Low Overall Cost

Proven, Effective Formula

Prelube 5000™

for blowing fiber optic microcables

Thinner Viscosity

Field Developed & Tested

New, More Concentrated Formula



Polywater®

Prelube 2000™

for blowing conventional fiber optic cable

Polywater® Prelube 2000™ reduces frictional drag during the blowing of outside plant cable into duct. It increases the length of cable that can be blown in a single shot. Prelube 2000™ can also be used to blow in the hollow microtubes intended to hold future microcables. Over the last decade, Prelube 2000™ has been proven in the blowing of tens of thousands of kilometers of cable in over 100 countries on a variety of cable blowing machines.

Features

- Polywater® Prelube 2000™ has proven superior to paraffin oils and cable pulling lubricants for cable blowing. The use of this lubricant results in longer installation distances.
- Polywater® Prelube 2000™ is recommended by most blowing equipment manufacturers. It increases installation distance on all types of machines.
- Polywater® Prelube 2000™ is more economical than prelubricated ducts.
- Polywater® Prelube 2000™ is compatible with common fiber optic cable jackets.

Application

A properly installed duct system with pressure-tight duct splices is an absolute necessity for efficient cable blowing. Follow the equipment manufacturer's instructions. The duct must be clean, dry, and mandral tested. Clean the duct by blowing a tight-fitting foam sponge through the duct with high pressure. If excess water or dirt comes from the duct, repeat the process. Prelube 2000™ is effective at a coating thickness of 0.5 mg/cm^2.

For smoothwall duct and high air speed machines (no missile), squeeze the recommended amount of Prelube 2000™ Lubricant from the table below into the duct. Spread the lubricant by blowing a foam carrier through the duct. The quart squeeze bottle (Cat. # P-35) is a good package for this type of application.

Duct Size	Lubricant Quantity	
	per 1,000 Feet	per Kilometer
1" (2.5 cm)	4 fl. oz.	400 ml
1.25" (3 cm)	5 fl. oz.	500 ml
1.5" (4 cm)	6 fl. oz.	600 ml
2" (5 cm)	8 fl. oz.	800 ml

For smooth wall duct (ID 1 to 1.25 inch) and piston type machines, use 5 to10 fl. oz. per thousand feet of duct (0.5 to 1.0 liter per kilometer). Place 75% of the lubricant in front of the missile and the rest behind. The lubricant is spread by the missile as the cable is blown.

Polywater® Prelube 5000™

for blowing fiber optic microcables

Polywater® Prelube 5000™ is more concentrated than the Prelube 2000™. It is intended for blowing microcable into small diameter microtubes. The improved chemistry allows this product to spread farther and lower friction at extremely low coating levels. The lower viscosity allows practical application into the microtubes.

Features

- Polywater® Prelube 5000™ is easy to use. It can be squeezed into the small diameter microducts.
- Polywater® Prelube 5000™ works at extremely low coating levels. It coats farther and more effectively than conventional blowing lubricants.
- Polywater® Prelube 5000™ has proven superior in side-by-side testing in blown microcable installations.
- Polywater® Prelube 5000™ is compatible with known microcable plastic jackets. However, it should not be used for resin-coated fiber cables.

Application

The microduct tubing must be pressure tight. Clean and dry the tubing by blowing a tight-fitting foam sponge through the microduct with high pressure. If excess water or dirt comes from the microduct, repeat the process. Trapped water can block the air flow.

Prelube 5000™ is effective at quantities *as low* as 0.05 mg/cm^2. Squeeze recommended amount of lubricant into microduct. Quantity can be measured with a syringe or estimated based on duct fill length (table below). Spread lubricant by blowing a foam carrier or sponge through the microduct as many times as necessary to avoid puddling at the front of the duct.

Tube Size (OD/ID)	Lubricant per Kilometer Tube		Lubricant per 1,000 Feet Tube	
	Volume Required	Microtube Fill Length	Volume Required	Microtube Fill Length
14/12 mm	29 ml	26 cm	0.30 fl. oz.	3”
12/10 mm	24 ml	31 cm	0.25 fl. oz.	4”
10/8 mm	19 ml	39 cm	0.20 fl. oz.	5”
8/6 mm	14 ml	52 cm	0.15 fl. oz.	6”
7/5 mm	12 ml	62 cm	0.13 fl. oz.	7”
5/3.5 mm	9 ml	88 cm	0.09 fl. oz.	10”
4/3 mm	7 ml	103 cm	0.08 fl. oz.	12”

The quantities of lubricant appropriate for any job will vary with the size, type, and condition of the duct. Use the recommendations above as a place to start and adjust as necessary.

Cost Effectiveness

Polywater® Prelube 2000™ offers significant cost savings over "factory-lubricated" duct. In high-quality HDPE duct, it lubricates efficiently at coating levels of 0.5 mg/cm² of duct surface. At these levels, the lubricant cost for 1.25" (3.2 cm) duct is approximately $2 per 1,000 feet ($6 per kilometer), much lower than the additional cost for factory-lubricated duct.

Polywater® Prelube 5000™ is extremely efficient and cost effective. It lubricates at coating levels as low as 0.05 mg/cm^2 of the tubing's interior surface. At these levels, the lubricant cost is $0.20 to $0.75 per 1,000 feet ($0.60 to $2.20 per kilometer) depending on microtube size.

Packaging and Catalog Numbers

Package Size	Prelube 2000™	Prelube 2000™ Winter Grade	Prelube 5000™ for Microcables
1-qt squeeze bottle (0.95 liter)	P-35	WP-35	
1-gal pail (3.8 liter)	P-128	WP-128	
5-gal pail (19 liter)	P-640	WP-640	
8-fl. oz. squeeze bottle			PM-8

References

1. Installation of Fiber Optic Cables in Duct, W. Griffioen, Plumettaz S. A., 1993

2. The Use of the High Air-Speed Blown-Cable System for Placing Optical-Fiber Cables in Ducts, P. R. Briggs et al, NFOEC Conference, 1993

3. Analysis and Measurement of Friction in High Speed Air Blowing Installation of Fiber Optic Cable, J. M. Fee et al, NFOEC Conference, 1995

See the web page **www.polywater.com/airblow.html** for additional information on high-speed air-assisted cable installation.

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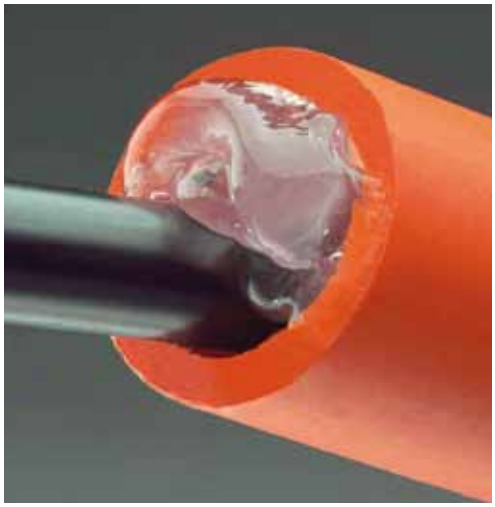
IceFree™

Antifreeze Gel System



A specialty, non-freezing gel which is pumped into conduits (around cable) to prevent water ingress and subsequent ice formation.

This system has successfully protected fiber optic cable in thousands of bridges exposed to below freezing temperatures.

- **Prevents water ingress and ice formation in innerducts and conduits**
- **Protects fiber optic cable from ice pressure-induced microbends**
- **Compatible with cable jacket and duct**
- **Safe for the environment**
- **Patented system**
- **Avoids system downtime due to cold-weather signal degradation**
- **Protects all cable from ice damage**
- **Soft gel allows cable removal for repair or upgrade**
- **Install once for multi-year protection**
- **Installation video and literature available**

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Adhesives

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Polywater® BonDuit®

PE CONDUIT ADHESIVE



Joining HDPE to PVC conduit

Strong, Watertight, and Airtight Adhesive for HDPE Conduit

PRODUCT BENEFITS

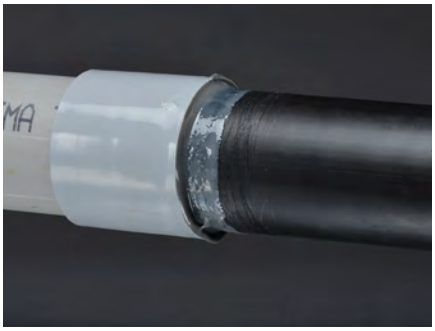
- **Versatile:** Bonds HDPE to PVC, rigid steel, and fiberglass conduits and fittings.
- **Superior:** Stronger pullout strength than mechanical couplings.
- **Durable:** Bonds with high strength within an hour.
- **Easy to Use:** Requires no special training.
- **Convenient Kits:** Contains all application components required for a quick installation.

Creates Strong, Long-Lasting Bonds

BonDuit® Conduit Adhesive creates a watertight and airtight conduit connection within an hour after application. The strong bond withstands movement and vibration, ideal for installation along roadsides or near electrical equipment such as transformers or switchgear.



Fiberglass pipe connection



Completed PE to PVC joint

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American Polywater® Corporation



PE to PVC conduit connections



Catalog # BT-KITG

Multi-Use Cartridge Creates Numerous Connections

BonDuit Conduit Adhesive is a two-part curing adhesive supplied in a side-by-side cartridge. BonDuit requires a ratcheted dispensing tool and nozzle to mix and apply quickly and easily. Several connections can be made from a cartridge. The cartridge can be recapped for later use with a new nozzle.

POLYWATER BONDUIT

Catalog #	Package Description	Units/Case
BT-KIT	2 - adhesive cartridges; 8 - mixing nozzles; 1 - strip of sanding cloth; 8 - Type RP™ cleaning wipes (cat #RP-1)	1
BT-KITG	Same as kit above; includes TOOL-50-11	1
BT-KITB6	12 - adhesive cartridges; 48 - mixing nozzles; 6 - strips of sanding cloth; 48 - Type RP cleaning wipes (cat# RP-1). Dispensing tool not included.	1
BT-KITB6G	Same as kit above; includes TOOL-50-11	1
BT-CART12PK	12 - adhesive cartridges 36 - mixing nozzles	1
TOOL-50-11	1 - dispensing tool	1
MXR-12T-10	10-pack of mixing nozzles	1

SPECIFICATIONS AND APPLICATIONS:

- **The NEC Code:** Requires PVC or galvanized rigid steel pipe to be used for the transition from underground HDPE pipe to above ground connections. PVC pipe cement doesn't bond HDPE.
- **Adhesive Shear Strength:** Typical bond strengths were measured by joining two pieces of HDPE conduit with a PVC coupling and BonDuit Adhesive. The force required to pull apart the joint after 24 hours at 70° F (21° C) was measured. Conduit diameter pullout force 1½" = 1233 lbs./sq. ft.; 2" = 2,025 lbs./sq. ft.; 4" = 5,333 lbs./sq. ft.

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BonDuit® Conduit Adhesive

American Polywater® Corporation

TECHNICAL DATA SHEET

Description:

BonDuit® Conduit Adhesive joins polyethylene duct to PVC, fiberglass, and metal duct using standard PVC couplings. This rapid-cure, two-part resin adhesive forms a durable bond for a strong, permanent, water-tight joint.

BonDuit® Conduit Adhesive is a versatile field-friendly conduit joining solution. It works for multiple conduit types and sizes. It is easy to use and no special training is required.

Adhesive Shear Strength:

Typical bond strengths were measured by joining two pieces of HDPE conduit with a PVC coupling and BonDuit® Adhesive. The force required to pull apart the joint after 24 hours at 70° F was measured.

Conduit Diameter	Pullout Force
1 Inch	724 lbs_f
1½ Inch	1233 lbs_f
2 Inch	2,025 lbs_f
4 Inch	5,333 lbs_f

Results based on 3rd-party laboratory testing.

Hydrostatic (Pressure) Testing:

BonDuit® Conduit Adhesive forms a water-tight joint. HDPE duct was joined to PVC duct with a PVC coupling and the adhesive. The ducts were filled with water, sealed, pressurized to 120 psi, and observed over time for leakage. The joint was then subjected to a short duration, high pressure test.

Test Duration	Result
1,000 Hours	No Leaks

Continuous pressure test based on ASTM D1598, "Time to Failure of Plastic Pipe Under Constant Internal Pressure".

Short Duration High Pressure (Burst Test)

Maximum Pressure	Result
>250 psi	No Leaks

Burst test based on ASTM D1599, "Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing and Fittings (Burst Test)".



Bonduit® Conduit Adhesive is supplied in a two-part cartridge and is mixed as it is applied.

Product Benefits:

- Easy to use
- Fast cure
- Durable bond
- Water-tight and air-tight seal
- High tensile strength
- Suitable for most common ducts

End Use:

BonDuit® Conduit Adhesive bonds polyethylene to:

- PVC Couplings
- Concrete Vaults
- Transition Couplings
- Above Ground Conduits
- Steel Sweeps and Elbows
- Fiberglass and Composite Connections

Component Physical Properties:

BonDuit® Conduit Adhesive is a 2-part resin. Both parts are thin pastes packaged in a mixing cartridge.

Property	Part A (Resin)	Part B (XL Agent)
Color	Dark Grey/Black	White/Light Yellow
Form	Paste	Paste
Odor	No Odor	Slight Sulfur Odor
VOC:	0 g/L	0 g/L
Specific Gravity	< 2	< 2

Typical Cured Resin Properties:

BonDuit® Conduit Adhesive cures to form a solid, durable resin seal.

Typical Property (7 Days cure @ 70º F)	
Color	Grey
Peak Exotherm @ 70º F	< 200º F
Hardness (Shore D Durometer)	70 – 80
Flexibility (ASTM D790)	> 2%
Dielectric Strength (ASTM D149)	450 Volts/Mil (Nonconductive)
Air-tight (continuous):	120 psi

Typical Adhesive Shear Strength:

Substrate	Result
HDPE to PVC	275 lbs/in^2
HDPE to Steel	550 lbs/in^2
HDPE to Aluminum	325 lbs/in^2
HDPE to Fiberglass	175 lbs/in^2
Fiberglass to Steel	525 lbs/in^2
Fiberglass to PVC	125 lbs/in^2
Fiberglass to Fiberglass	375 lbs/in^2

Tested using ASTM D1002. Samples sanded, cleaned and cured for 24 hours.

Typical Impact Resistance:

Substrate	Result
HDPE	24.8 in-lbs
PVC	37.2 in-lbs
Galvanized Steel	22.3 in-lbs
Fiberglass	37.2 in-lbs

Tested using ASTM G14. Samples are sanded, cleaned and allowed to cure for 24 hours.

Bonding Materials:

BonDuit® Conduit Adhesive adheres to:

- Polyethylene
- PVC, CPVC
- Composite
- PEX
- ABS
- Polypropylene
- Fiberglass
- Concrete
- Porcelain
- Steel
- Aluminum
- Copper

Environmental Resistance:

BonDuit® Conduit Adhesive can withstand the typical rigors of the conduit environment.

Temperature Cycle Testing: 10 cycles from 0º F to 130º F showed no significant change in adhesion

BonDuit® Conduit Adhesive, if applied and frozen before cure, shows no significant change in adhesion when warmed and allowed to cure at a later time.

BonDuit® Conduit Adhesive withstands ultraviolet and direct sunlight exposure with no decrease in functionality.

Chemical Resistance:

The chemical resistance of a polyethylene to PVC bond (joined with BonDuit® Adhesive) is tested by measuring shear strength after exposure to the reagent compared to a non-exposed control. The joint is allowed to cure 7 days, immersed in the reagent, and then aged at ambient temperature for 3 months.

Chemical Exposure	Percent of Control
Salt Water (4%)	85% (Pass)
Alkaline Soap Solution (pH 12)	100% (Pass)
Odorless Mineral Spirits	>100% (Pass)

The BonDuit® Adhesive bond shows good resistance to salt water, alkaline solutions, and odorless mineral spirits (paraffinic solvent). A 6-month water & oil soak test also shows no significant change in adhesion compared to a control.

Application:

BonDuit® Adhesive is easy to use. For full installation information, please see BonDuit® Usage Instructions. *(www.polywater.com/BTinstructions.pdf)*

One 50-ml cartridge will produce a ¼-inch bead of the mixed adhesive approximately 42 inches long.

Preparation:
Proper surface preparation ensures a strong, long-lasting, airtight and watertight bond. The surface should be sanded and cleaned with a RP™ Cleaner Wipe to remove oils and displace any remaining water. Adhesion using different surface preparation methods was tested using a lap shear test. In this test, BonDuit® Conduit Adhesive is applied to create an overlapping bond between HDPE and PVC.

Surface Preparation	Percent of Control Bond Shear Strength
No Preparation	100% (Control)
Cleaner Only	120%
Sanding Only	410%
Cleaner & Sanding	480%

Application Temperature
Working temperature for BonDuit® Conduit Adhesive is 35°F to 95°F (2°C to 35°C).

Cool Weather Application
In cool weather (below 60°F, 16°C) keep BonDuit® Conduit Adhesive warm before using, above 60°F (16°C). Keep couplings in a warm area before use. It may be necessary to heat the transition joint to force adhesive cure. Below 35ºF (2°C), the joint should be heated to cure the adhesive.

Warm Weather Application
In warm weather (above 85°F, 29°C), keep BonDuit® Conduit Adhesive cool, below 70°F (21°C). This will help keep the adhesive from curing before coupling is attached. If possible, use adhesive to make bonds in the cooler mornings and out of direct sunlight to slow down cure rate.

Safety:

BonDuit® Conduit Adhesive has a low level of toxicity. Good industrial hygiene practice and appropriate precautions should be employed during use. Provide appropriate ventilation/respiratory protection against decomposition products during welding/flame operations (i.e. torches used to install heat shrink products) on or near cured product. See SDS for specific details.

Cure Rate:

BonDuit® Conduit Adhesive develops a strong bond, allowing movement or burial quickly.

Temp.	Working Time	Set Time
35°F (2°C)	40 min	7 hrs
52°F (11°C)	20 min	3 ½ hrs
60°F (16°C)	10 min	1 ½ hrs
70°F (21°C)	6 min*	60 min
88°F (31°C)	4 min*	40 min

After one hour at 70°F (21°C), the BonDuit® resin will reach approximately 50% of its cure strength and will “set”. It will continue to cure and will reach maximum bond strength after approximately 24 hours at 70°F (21°C).

Once cured, conduit joints made with BonDuit® Adhesive will hold adequate air pressure for cable blowing operations.

Cure Time at 70°F	Air Pressure	Result
90 Minutes	150 psi	Pass
120 Minutes	200 psi	Pass

The prepared conduit system holds the above pressure for 10 minutes.

Installation:
Joints made with BonDuit® Conduit Adhesive can be placed into position once the connection is made. The adhesive will cure under water or under ground. Conduits can be put into service once full cure is reached.

Storage and Handling:

Keep cartridge tightly closed in a cool, dark, dry location. Reseal cartridge after use. Keep away from sources of ignition and protect from freezing. All cartridges should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

Unopened product has a shelf life of 18 months.

Model Specification:

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

Approved conduit joining system is BonDuit® Conduit Adhesive. The conduit adhesive shall come in a multiple-use cartridge to bond various conduit connections without special fitting or positioning jigs. The packaging shall automatically mix and meter the adhesive. The cure rate for the adhesive shall be fast, reaching 50% of final strength in one hour (@ 75° F), and 80% of final strength in two hours (@ 75° F). The peak exotherm temperature of mixed product shall not exceed 200° F (20 gram sample.) Product shall be suitable for use on various duct materials, multiple duct sizes and connection types.

Once cured, the adhesive seal shall be airtight and watertight. A one-inch, PVC coupling sealed to a polyethylene duct with the adhesive shall hold 120 psi air pressure after curing one hour at 75° F. The pull-out strength of a two-inch polyethylene duct sealed to a PVC coupling shall be at least 910 lbs force after curing one hour at 75° F and at least 1820 lbs force after curing for 24 hours. The adhesive shall have a minimum flexural strain of 2% as measured by ASTM D790.

The cured adhesive shall be resistant to water, salt water, oils, and uv degradation. The cured bond shall withstand temperature extremes from -60° F to 250° F. It shall withstand multiple freeze-thaw cycles. The cured product shall be non-conductive with a minimum dielectric strength of 450 Volts/Mil as measured by ASTM D149.

Order Information:

Cat #	Package Description
BT-KITG	Kit contains: 2 50-ml BonDuit® Adhesive Cartridges 8 Mixing Nozzles 1 Strip of Sanding Cloth 8 RP-1 Cleaning Wipes 1 Instruction Sheet 1 Dispensing Tool
BT-KIT	Kit contains: 2 50-ml BonDuit® Adhesive Cartridges 8 Mixing Nozzles 1 Strip of Sanding Cloth 8 RP-1 Cleaning Wipes 1 Instruction Sheet (Dispensing tool not included.)
BT-KITB6G	Bulk kit contains 6 Individual Kits, BT-KIT 1 Dispensing Tool Included
BT-KITB6	Bulk kit contains 6 Individual Kits, BT-KIT (Dispensing tool not included.)
TOOL-50-11	1 Dispensing Tool
MXR-12T-10	10 Mixing Nozzles
BT-CART12PK	12 50-ml BonDuit® Adhesive Cartridges in a Package

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American Polywater expressly disclaims any implied warranties and conditions of merchantability and fitness for a particular purpose. American Polywater's only obligation shall be to replace such quantity of the product proven to be defective. Except for the replacement remedy, American Polywater shall not be liable for any loss, injury, or direct, indirect, or consequential damages resulting from product's use, regardless of the legal theory asserted.

Lit-BTTECH/REV004

Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ Software

American Polywater® Corporation

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http://www.polywater.com (URL) support@polywater.com (e-mail)



Sealants

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Polywater® FST™

FOAM DUCT SEALANT



Installation of Polywater FST-250

For Sealing Conduits and Risers from Moisture, Gases, and Rodents

PRODUCT BENEFITS

- **Meets NEC Code Requirements**: 2011 NEC Articles 225.27, 230.8, 300.5(G), 300.7 (A) on Raceway Seals, and 501.15 (B)(2).
- **Reliable:** Holds 22 feet (6.0-6.5 m) of water head pressure and up to 90-foot (27 m) surges.
- **Seals Multiple Conduits:** Can seal conduits of all sizes and is reenterable.
- **Compatible:** Use with a wide range of cable jacket and conduit materials.
- **Solves Critical Application:** Class 1, Div 2 locations and areas subject to temperature variations.

Protects Conduit and Raceway Systems

FST™ closed-cell sealant provides superior pressure-blocking in the toughest environments. It stops water, methane, and other gases to keep electrical systems intact. FST Duct Sealant is durable and easy to install. FST is chemically resistant and has excellent adhesion to conduits.



Installation of Polywater® FST MINI



Riser seal application

polywater.com | 651-430-2270

American Polywater® Corporation



FST works in all types of conduits



FST-250KIT contents

Multi-Use Cartridge Creates Numerous Seals

FST kits contain everything needed for an effective seal. Polywater FST-250 can be dispensed with a standard high-ratio caulking gun. Polywater FST MINI kits are available with or without a dispensing tool.

POLYWATER FST

Catalog #	Package Description	Units/Case
FST-250KIT1	1 - 8.5-oz two-part FST Foam Sealant caulking tube (cat# FST-250); 3 - mixing nozzles; 4 - 24" foam damming strips (cat# FST-DAM); 1 - 12" abrasive strip; 1 - pair of gloves; 1 - positioning rod for foam dam; 1 - pre-treating wipe (cat# HP-P158ID); 1 - resealing cap; 1 - instruction sheet. TOOL-250 NOT INCLUDED - SOLD SEPARATELY	1
FST-250KIT	Same as kit above in a box of 6	6
FST-250	1 - 8.5-oz two-part FST Foam Sealant caulking tube; 1 - mixing nozzle; 1 - resealing cap	12
MXR-30T-10	10-pack of mixing nozzles for FST-250	1
TOOL-250	1 - high-ratio caulking gun	1
FST-DAM	1 - 24" foam damming strip	24
FST-MINI-1	1 - 50-mL cartridge; 2 - mixing nozzles; 6 - foam discs; 2 - pairs of gloves; 1 - instruction sheet	1
FST-MINI-1G	Same as above; includes TOOL-50-11	1
FST-MINI-B6	6 - FST-MINI-1	1
FST-MINI-B6G	Same as above; includes TOOL-50-11	1
TOOL-50-11	1 - dispensing tool for FST MINI	1
MXR-20T-10	10-pack of mixing nozzles for FST MINI	1

SPECIFICATIONS AND APPLICATIONS:

- **Application:** FST-250 is recommended for 2-inch (51 mm) or larger conduits. It comes in a multi-use single-plunger caulking tube that uses a standard high-ratio caulking tool (TOOL-250). FST MINI is recommended for conduits less than 1.5 inches (38 mm).
- **Adhesion:** Bonds to PVC, GRS, EMT, IMC, fiberglass, and PE conduits. Ducts can be reentered.
- **Attention:** Due to varying interpretations of the NEC code, please consult the AHJ before use in Class 1, Div 2 hazardous locations.

CONTACT US

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1-651-430-3634 Fax

email: support@polywater.com

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American Polywater® Corporation

11222 60th Street N | Stillwater, MN 55082 USA

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Polywater® FST™ Duct Sealant

Finally, a sealant that meets the NEC codes for Raceway Seals...

...THAT'S EASY TO INSTALL AND REMOVE FROM CONDUITS.



- Re-enterable
- Stops gases
- Holds 22 feet of water head pressure continuously
- Compatible with wire and cable jackets

Polywater® FST™ Foam Duct Sealant meets and exceeds the NEC code requirements for sealing conduits. Polywater® FST™ is superior to both duct putty and aerosol cans of foam because it has been tested for cable compatibility; holds 22 feet of water head pressure continuously and up to 90 feet intermittently; prevents the passage of gas; does not sag; will not dry out; and is re-enterable. FST™ sealant is chemically resistant to gasoline, oils, dilute acids and bases, and most unsaturated hydrocarbons. Review our technical bulletin to see our extensive ASTM product testing.

FST™ meets the following from the NFPA 70® National Electrical Code® 2008, 2011 Editions:

NEC 225.27 Raceway Seal. Where a raceway enters a building or structure from an underground distribution system, it shall be sealed in accordance with 300.5(G). Spare or unused raceways shall also be sealed. Sealants shall be identified for use with the cable insulation, shield, or other components.

NEC 230.8 Raceway Seal. Where a service raceway enters a building or structure from an underground distribution system, it shall be sealed in accordance with 300.5(G). Spare or unused raceways shall also be sealed. Sealants shall be identified for use with the cable insulation, shield, or other components.

NEC 300.5(G) Raceway Seals. Conduits or raceways through which moisture may contact live parts shall be sealed or plugged at either or both ends.

Informational Note: Presence of hazardous gases or vapors may also necessitate sealing of underground conduits or raceways entering buildings.

NEC 300.7 (A) Sealing. Where portions of a cable raceway or sleeve are known to be subjected to different temperatures and where condensation is known to be a problem, as in cold storage areas of buildings or where passing from the interior to the exterior of a building the raceway or sleeve shall be filled with an approved material to prevent the circulation of warm air to a colder section of the raceway or sleeve. An explosion proof seal shall not be required for this purpose.

NEC 501.15 (B)(2) Conduit Seals, Class 1 Division 2: A conduit seal shall be required in each conduit run leaving a Class 1, Division 2 location... and it shall be designed and installed to minimize the amount of gas or vapor within the portion of the conduit installed in the Division 2 location... Such seals shall not be required to be explosion proof..."

** As always with the NEC code it is prudent to check with and get approval from the AHJ before installing any product in a hazardous location area due to varying interpretations*

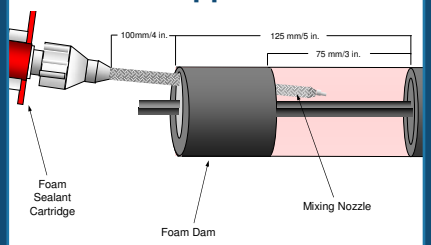


AVOID THIS!



www.polywater.com/FSTspec.pdf

FST™ Application



www.polywater.com/videos.ASP

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LIT-FST250NECFLYER/REV001

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www.polywater.com

To: Polywater® Product Specifier
From: American Polywater Corporation - Electrical Division
Date: July 28, 2011
RE: Polywater FST-250 Foam Duct Sealant

Polywater® FST foam duct sealant meets and exceeds the NEC code requirements for sealing conduits. Polywater® FST is superior to both duct putty and aerosol cans of foam because it has been tested for cable compatibility, holds 15 feet of water-head pressure continuously and up to 40 feet intermittently, prevents gas from passing through it, does not sag, will not dry out and is re-enterable. FST sealant is chemically resistant to gasoline, oils, dilute acids and bases, and most unsaturated hydrocarbons. Review our technical bulletin to see our extensive ASTM product testing.

NFPA 70® National Electrical Code® 2011 Edition

225.27 Raceway Seal. Where a raceway enters a building or structure from an underground distribution system, it shall be sealed in accordance with 300.5(G). Spare or unused raceways shall also be sealed. Sealants shall be identified for use with the cable insulation, shield, or other components.



230.8 Raceway Seal. Where a service raceway enters a building or structure from an underground distribution system, it shall be sealed in accordance with 300.5(G). Spare or unused raceways shall also be sealed. Sealants shall be identified for use with the cable insulation, shield, or other components.

300.5(G) Raceway Seals. Conduits or raceways through which moisture may contact live parts shall be sealed or plugged at either or both ends.
Informational Note: Presence of hazardous gases or vapors may also necessitate sealing of underground conduits or raceways entering buildings.



300.7 (A) Sealing. Where portions of a cable raceway or sleeve are known to be subjected to different temperatures and where condensation is known to be a problem, as in cold storage areas of buildings or where passing from the interior to the exterior of a building, the raceway or sleeve shall be filled with an approved material to prevent the circulation of warm air to a colder section of the raceway or sleeve. An explosionproof seal shall not be required for this purpose.

Duct Putty:



Open cell canned foam:



Polywater® FST-250:



American Polywater's

Foam Sealant (FST) Quantity Calculation

Page

This page will estimate the quantity of FST Foam Sealant needed and the correct sized package to seal different sized conduits.

http://www.polywater.com/calculators/fstcalculator.asp

FST™ Foam Sealant

American Polywater® Corporation

TECHNICAL DATA SHEET

Description:

FST™ Sealant is a two-part, high-expansion foam duct sealant. It keeps water, acids, dust, gases, insects, and rodents out of the duct. FST™ Sealant expands and hardens to a "closed cell," rigid structure. This permanent, but removable, seal blocks both water and gas under moderate pressure.

FST™ Sealant comes in a multi-use, single-plunger caulking tube package. The foam wets and adheres to metals, plastics, and concrete, and can seal ducts of different sizes, base materials, and shapes. It will conform around complex cable fill configurations. A kit contains everything required to install the duct block (application tool available separately).

Water Blockage:

FST™ Sealant is an excellent water block. To test water blocking performance, it is installed into a conduit according to standard procedures, forming a 3-inch plug. Water is added to the system and then pressurized to create a "water head."

Condition	Result
HDPE Duct, (SDR 13.5) No Cables	Holds 7 days at 30 psi (70 feet of water)
PVC Conduit, No Cables	Holds 450 days at 10 psi (22 feet of water)
PVC Conduit, 3 MDPE Cables	Holds 15 min at 40 psi (90 feet of water)
PVC Conduit, 3 MDPE Cables *bent* 45°, opposite directions for 5 minutes	Holds 15 min at 40 psi (90 feet of water)
PVC Conduit, 3 MDPE Cables *pulled* with 15 lbs axial force for 4 hours	Holds 15 min at 40 psi (90 feet of water)

FST™ Sealant blocks considerable water head pressure, even when forces are placed on the cable to stress the seal.



The FST™ Sealant comes in a caulking style (one plunger) tube. Package allows multiple seals. Mixing is done in the nozzle as the sealant is injected.

Product Benefits:

- Meets 2011 NEC Articles 225.27, 230.8,300.5(G), and 300.7(A) on Raceway Seals, and 501.15(B)(2)
- Creates a strong, resilient, chemically resistant seal
- Holds 22 feet water head pressure continuous; 70 feet water head intermittent
- Expands, cures, and seals even when water is present
- Controlled injection quantity—no waste
- Seal tolerates cable movement and environmental extremes
- Compatible with common cable and wire jackets
- Single cartridge can seal multiple ducts
- Re-enterable—seal can be removed
- Complies with TIA-758-B Standard 5.1.1.2.8, 5.4.2.3 and 7.4.2.8.1

Official Approvals:

UL Recognized

Passes UL94
Class HBF fire retardant rating

Component Properties:

FST™ Sealant is a two-part, urethane foam. The liquid Part A and B are formulated to be mixed at a 1/1 ratio using the two-part coaxial caulking tube with the static mixing nozzle provided.

Property	Part A (Resin)	Part B (Curing Agent)
Color	Amber	Clear
Form	Liquid 250 cps	Liquid 650 cps
VOC Content	0 g/L	0 g/L
Specific Gravity	1.2	1.1

Cured Properties:

FST™ Sealant cures to solid, closed-cell foam.

Property	Typical Result
Appearance	Light yellow color with small, even cells
Closed Cell Percent	98%
Density	6 lbs/cu. ft.
Compressive Strength (ASTM D1621)	120 psi
Tensile Strength (ASTM 1623)	270 psi
Flexural Strength (ASTM D790)	460 psi
Seal Strength—Water	70 feet intermittent 20 feet continuous
Seal Strength—Air	>5 psi

Seal Strength–Air and Other Gases:

FST™ Sealant can seal out manhole gases. To test seal strength, a 3-inch FST™ seal is installed into conduit according to standard directions. The conduit is sealed and pressurized with both air and helium. Helium is a small molecule, less than half the size of methane gas, and was used in place of methane.

Condition	Result
Air, 10 psi, 168 hours	Holds Seal
Helium, 5 psi, 72 hours	Holds Seal

The FST™ Sealant closed-cell foam will block air and other gases for an extended period of time.

Cable Removal/Theft Deterrent Testing:

FST™ Sealant acts as a theft deterrent by sealing cables into the conduit. To test this, a 3-inch plug of FST is used to seal 3 cables in a conduit according to standard procedures. The force to pull out each cable is measured.

Cable Type	Average Pull-Out Tension (lb_f)
2 AWG THHN	171
4/0 XHHW	320

Draka *prelubricated* HDPE Cable in Conduit (CIC)	Average Pull-Out Tension (lb_f)
1-¼ inch with (2) RHW-2 awg cables and ground	188*
1-½ inch with (3) RHW-2 awg cables and ground	179*

**Entire foam core pulled out of the conduit.*

FST™ Sealant increases the cable holding force, making removal by hand very difficult.

Cable Compatibility:

FST™ Sealant is compatible with common cable jacket materials. It does not change physical or electrical property of cable, based on tensile - elongation and volume resistivity testing. The cured foam is an inert solid that does not affect cable components.

Chemical Resistance:

FST™ Sealant is chemically resistant to gasoline, oils, dilute acids and bases, and most unsaturated hydrocarbons.

Environmental Resistance:

FST™ Sealant withstands the rigors of the conduit exposure environment.

Service Temperature Range
-40° F to 200° F (-40° C to 93° C) Continuous

FST™ Sealant does not lose function in direct sunlight. Reacted foam that is exposed to UV will yellow. This discoloration does not affect performance; the foam seal retains its hardness and continues to act as a duct block.

The foam sealant can be protected with a weather-proofing paint. Urethane products have been tested with good results and excellent adhesion to the foam.

Application:

Field-Ready Kit
The FST™ Sealant kit includes all materials required to install a finished duct block.

Seal Length
It is most important to make a seal of adequate length by using and properly spacing the damming strips. A 3-inch plug will meet performance guidelines.

Application Temperature
Working temperature for Polywater® FST™ Sealant is 35° F to 95° F (2° C to 35°C).

Water in Duct
FST™ Sealant will cure and seal duct with small amounts of water present. The water should not be flowing, and should be relatively clean. The FST™ foam will incorporate water into its cure. However, excessive water will weaken the seal.

For full installation information, please see the FST™ Installation Instructions.
(www.polywater.com/fstinstructions.html)

Cure Rate:

The FST™ Sealant can be used in temperatures down to 35° F (2° C). At low temperatures, the reaction is slow, but the sealant will completely foam and cure with time. At cold temperatures, the sealant components become more viscous and flow through the mixing nozzle at a slower rate. Cure times are as follows:

	Reaction Time (Minutes)	
	40° F (4° C)	70° F (21° C)
Foaming, Expansion Complete	8–9	4–5
Hard, Non-sticky Skin Formation	15–18	7–9

Once a skin has formed, the foam may be visually inspected to determine whether the seal has completely filled the void. After the sealant has cured, the positioning rod or a screwdriver can be used to check for voids in the finished seal.

To decrease cure time in cold temperatures, warm FST™ Sealant cartridges prior to use.

Clean-up:

Any unreacted material may be cleaned from surfaces with a solvent wipe such as Polywater® Type HP™ Cleaner/Degreaser. The Part A amber resin will react with water if surfaces are washed with a soap and water solution. Once reacted, the foam has strong adhesion, and may be scraped or cut from surface.

Removal:

FST™ Sealant can be mechanically removed with some effort. Use a long screwdriver to puncture holes throughout the seal. With a hammer, punch the screwdriver through the foam, twist it to enlarge the cavity, and pull out. Once the foam is weakened, it can be chipped away, and the cable should break free.

Safety:

FST™ Sealant is a two-part urethane foam containing reactive chemicals. Polyurethanes are common in the construction industry and have been used for many years. Some individuals may become sensitized to components in the unreacted resin. Precautions must be observed during use and handling of these materials.

The use of FST™ in the prepackaged cartridge controls and reduces exposure. Once reacted, the foam is solid, closed-cell polyurethane. The finished product may be considered non-toxic. See SDS for more information.

Combustion of Cured Foam
Irritating and toxic smoke and vapors may form during combustion of cured FST™ Foam Sealant. If burning the sealant material cannot be avoided, provide appropriate ventilation/respiratory protection against decomposition products during flame-cutting operations.

Storage and Handling:

Keep containers cool, dry, and away from sunlight. Leave cartridges in the protective foil pouch until ready to use/reuse.

Product shelf life is one year. Shelf life is one month after the product is opened.

Model Specification:

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

Duct sealant shall be Polywater® FST™ Foam Sealant. Duct sealant shall be a 2-part, 98% closed-cell urethane foam. It shall react and set in 5–10 minutes at 70°F. It shall be capable of sealing 3/4"–10" conduits with multiple cable configurations. Duct sealant shall be reenterable. It shall be capable of withstanding temperatures from -40°F to 200° F; and be chemically resistant to gasoline, oils, dilute acids, and bases. Duct sealant shall not affect the physical or electrical properties of wire and cable.

Duct sealant shall have good adhesion to duct and cable jacket surfaces with good structural strength. It shall have 120-lb compressive strength (ASTM D1621). Duct sealant shall be capable of holding 22 ft. water head pressure continuous or 90 ft. water head pressure short-term. It shall block up to 5 psi gas or vapor continuous. It shall meet NEC codes for Raceway Seals, meet UL 94 fire rating HBF, and be UL recognized.

Order Information:

Cat #	Package Description
FST-250 (12 units/case)	8½-oz two-part foam sealant caulking tube style with resealing cap 1 ea static mixing nozzle
FST-250KIT1 (1 unit/case)	8½-oz two-part foam sealant caulking tube style with resealing cap 3 ea static mixing nozzles 4 ea 24-inch foam damming strips
FST-250KIT (6 units/case)	1 12-inch abrasive strip 1 pair disposable gloves 1 position rod 1 pre-treating wipe 1 instruction sheet
TOOL-250 (1 unit/case)	Ratchet application tool for FST-250
MXR-30T-10 (1 unit/case)	Mixing nozzle 10-pack (for FST-250)
FST-MINI-1 (1 unit/case)	50-ml two-part foam sealant, dual cartridge with resealing cap 3 ea static mixing nozzles6 ea foam plugs
FST-MINI-B6 (6 units/case)	1 pair disposable gloves 1 instruction sheet
TOOL-50-11 (1 unit/case)	Dispensing tool for 50-ml cartridge, FST-MINI
FST-DAM (24 units/case)	24-inch foam damming strip

***Custom kits available. Call factory for details.*

Quantity Calculator located online:
www.polywater.com/polywater-calculators/

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Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ Software

American Polywater® Corporation

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1-651-430-2270

http://www.polywater.com (URL) support@polywater.com (e-mail)

Polywater® FST™ MINI

FOAM DUCT SEALANT



Meets the NEC codes for conduit sealing

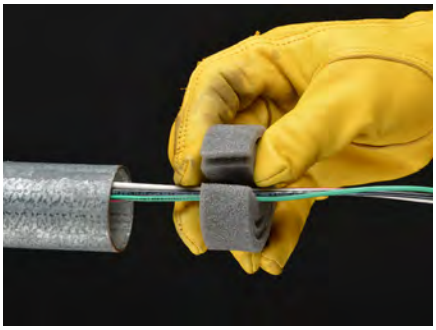
Foam Duct-Sealing System for Conduit Sizes ¾” up to 2”

PRODUCT BENEFITS

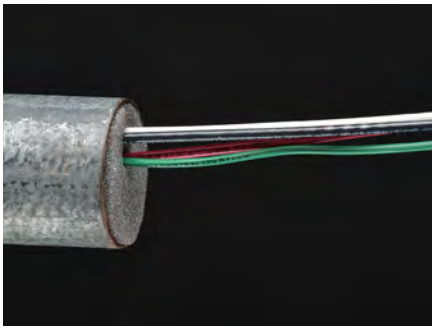
- **Strong:** Holds up to 22 ft/7 m of water head pressure.
- **Compatible:** PVC, rigid steel, EMT, fiberglass, and cable jackets.
- **Easy:** Two-part foam is mixed in nozzle as it is injected into duct.
- **Quick:** Foam expands and cures quickly even when water is present.
- **Multi-Use:** Packages are resealable.

Effectively Seals Small Conduits and Innerducts

Polywater® FST™ MINI is an expanding, quick-setting, “closed-cell" foam that is injected into a conduit to provide a watertight seal. The seal is superior to pliable duct putties and “open-cell” aerosol canned foams. Recommended for small conduits (less than 1.5 inches (38 mm)).



Positioning the wires



Foam dam strip inserted

polywater.com | 651-430-2270

American Polywater® Corporation



Insert nozzle past the first dam



Catalog # FST-MINI-1G

For Small Conduits and Innerduct Applications

One Polywater FST MINI cartridge seals approximately ten 1-inch ducts (25.4 mm). Polywater FST MINI meets and exceeds all NEC code requirements for sealing conduits: 2011 NEC Articles 225.27, 230.8, 300.5 (G), 300.7 (A) on Raceway Seals, and 501.15 (B)(2). It's perfect for cold storage electrical raceway entrances, with an approximate R-Value of 6.5 per inch.

POLYWATER FST MINI

Catalog #	Package Description	Units/Case
FST-MINI-1	1 - 50-mL cartridge 2 - mixing nozzles 6 - foam discs 1 - pair of gloves 1 - instruction sheet	1
FST-MINI-1G	Same as kit above; includes TOOL-50-11	1
FST-MINI-B6	6 - FST-MINI-1	1
FST-MINI-B6G	Same as kit above; includes TOOL-50-11	1
TOOL-50-11	Dispensing tool for FST-MINI-1	1
MXR-20T-10	10-pack mixing nozzles	1

SPECIFICATIONS AND APPLICATIONS:

- **Water Blockage:** Holds 22 feet water head pressure continuous: 70 feet water head intermittent.
- **Seal Strength:** Sealant can seal out manhole gases, such as methane.
- **Chemical Resistance:** Chemically resistant to gasoline, oils, dilute acids and bases, and most unsaturated hydrocarbons.

CONTACT US

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American Polywater® Corporation

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Polywater® AFT™

AEROSOL FOAM SEALANT



Installation of Polywater AFT-16

For Sealing Conduits and Risers from Moisture, Gases, and Rodents

PRODUCT BENEFITS

- **Quick Installation**: 2-minute application time or less.
- **Multiple-Use Can**: Creates numerous seals in all types of ducts.
- **Reliable:** Holds 10 feet of continuous water head pressure.
- **Durable**: Withstands cold temperature applications.
- **Removable:** Product can easily be removed to replace cable.

Protects Conduit and Raceway Systems

AFT™ closed-cell sealant provides 10 feet of water-blocking performance in electrical and telecommunication environments. The two-part, closed-cell AFT Sealant is durable and easy to install. AFT has excellent adhesion to a variety of conduits.



Steel conduit installation



Completed AFT-16 installation



Catalog # AFT-16

Provides Quick and Easy Installation

AFT seals conduit with quicker installation and higher performance compared to duct putty or single-part insulating hardware store foams. The two-part aerosol foam seals any size void and cures without exposure to air. AFT expands and cures to a rigid, closed-cell structure in minutes. AFT creates an airtight, watertight seal. AFT can be used to seal service entrances, conduit stub-ups, innerducts, inverters and combiners for solar installations, and riser poles for the electrical grid. AFT protects against insects, rodents, moisture, dust, and gases. The package is reusable, and the fire-retardant seal is self-extinguishing.

POLYWATER AFT

Catalog #	Package Description	Units/Case
AFT-16	1 - 16 oz. can; 2 – actuators	15
AFT-SAE10	10-pack of actuators with standard extension tube	1
AFT-FAE10	10-pack of actuators with flexible extension tube	1

SPECIFICATIONS AND APPLICATIONS:

- **Cable Compatibility:** AFT two-part foam sealant is compatible with common cable jacket materials. It does not change physical or electrical property of cable, based on tensile/elongation and volume resistivity testing. The cured foam is an inert solid that does not affect cable components.
- **Approvals:** AFT is UL recognized and passed UL94 with a Class HBF fire retardant rating.
- **Cure Rate:** AFT two-part foam sealant can be used at temperatures down to 45˚F (7˚C). At lower temperatures the reaction slows, but the sealant will completely foam and cure with time. AFT foam expands two times its volume as it is dispensed. Full expansion is complete in under 2 minutes at 70˚F (21˚C). It will take 3 to 5 minutes to be tack free. During this time do not move cables or touch foam.
- **Application:** Shake can for 60 seconds to mix. Lift hinge and insert dispensing nozzle into top orifices so that the arrow lines up with the dispensing nozzle. Invert aerosol can. Insert nozzle all the way into the seal space and fully squeeze the hinge to spray sealant into the conduit.

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American Polywater® Corporation

ZipSeal™

Duct Sealant



- Seals out Water, Sewer Gases, and Rodents From Conduits
- Installs in 45 Seconds
- Easy to Re-Enter
- Holds up to 10’ of Water-Head Pressure
- One Kit Seals Six 2” (50mm) Conduits
- Compatible with Cables and Conduits
- Complies with TIA-758-B Standard 5.1.1.2.8, 5.4.2.3 and 7.4.2.8.1 Sealing Ducts

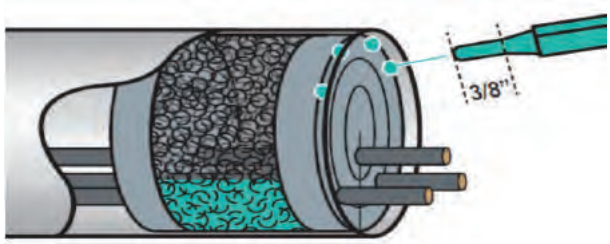


Open-Celled Canned Foams & Duct Putty

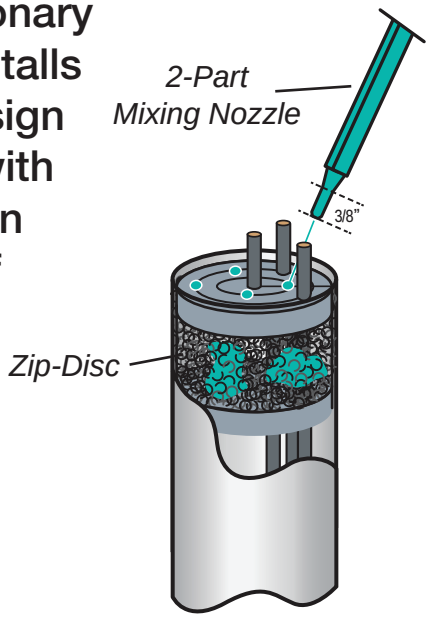
- Do Not Hold Water-Head Pressure
- Do Not Fully Cure in Conduits
- Sag and Dry Out Over Time

Polywater® ZipSeal™ Duct Sealant

ZipSeal™ Duct Sealant is a practical and efficient way to seal innerducts and conduits. The revolutionary Zip-Disc insert and unique two-part foam installs quickly and effectively. This innovative design allows for horizontal and vertical installation with minimal drippage. The foam can be removed in just minutes. ZipSeal™ can hold up to 10 feet of water-head pressure.



Horizontal application



Vertical application

Cat. No.	Package Components	Case Qty
ZIP-50KIT1	1 50mL two-part foam sealant cartridge w/ resealing cap, 2 static mixing nozzles, 2 pairs disposable gloves 5 2" Zip-Discs	1
ZIP-50KIT1G	ZIP-50KIT1 w/ dispensing tool	1
ZIP-KITB6	6 ZIP-50KIT1	6
TOOL-50-11	Dispensing tool	1
MXR-20T-10	Mixing nozzles	10



To view technical information on our website, go to

www.polywater.com/zipseal.html

For application videos

www.polywater.com/videos.asp

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ADHESIVES | CLEANERS | LUBRICANTS | **SEALANTS** WWW.POLYWATER.COM

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Polywater® PowerPatch®

TRANSFORMER LEAK REPAIR



Transformer radiator fin repair

Repair System for SF6 Gas- and Oil-Insulated Transformers

PRODUCT BENEFITS

- **Fast Repair:** Stops active leaks without shutting down equipment.
- **Convenient**: Seals active leaks in minutes. Also eliminates "bagging" of transformers during transit.
- **Resilient:** Seal is UV and weather resistant for long-term durability.
- **High Adhesion:** Adheres to numerous types of metals, porcelain, and rubber materials.
- **Chemically Inert:** Will not affect oils, solid insulation, or other equipment.

Stop Costly Outages

PowerPatch® quickly makes durable repairs of transformer oil and SF6 gas leaks as an economical and effective means to protect essential electrical grid assets. PowerPatch field repairs reduce costly unplanned outages and risks to the environment.



Pad-mounted transformer repair



Sealed bushing leak



"PILC" lead cable repair



Catalog # EPCT-KIT1G

Multi-Use Kits Make Diverse Repairs Easier

Polywater® PowerPatch Transformer Leak Repair permanently repairs oil and gas leaks commonly found in bushing and portal gaskets, nut and bolt fastenings, welding defects, and valve and meter connections.

POLYWATER POWERPATCH

Catalog #	Package Description	Units/Case
EPCT-KIT1	2 - PowerPatch 2-part cartridges; 4 - mixing nozzles; 2 - putty sticks (1¾ in/4 cm); 8 - Type RP™ cleaning wipes (cat # RP-1); 1 - sandpaper strip (24 in/61 cm); 4 - application sticks; 1 - instruction sheet. Multi-use kit. TOOL-50-11 must be purchased separately.	1
EPCT-KIT1G	Same as kit above; includes TOOL-50-11	1
EPCT-KITB6	A box with 6 EPCT-KIT1	1
EPCT-KITB6G	Same as kit above; includes TOOL-50-11	1
TOOL-50-11	1 - dispensing tool	1
EP-KIT11	1 - sealed plastic bag with 2-part sealant (part A & B); 1 - putty stick (1¾ in/4 cm); 2 - Type RP cleaning wipes (cat # RP-1); 1 - sandpaper strip (24 in/61 cm); 2 - mixing sticks; 1 - pair of gloves; 1 - instruction sheet	1
EP-KITB6	6 - EP-KIT11	1
EP-KITB12	12 - EP-KIT11	1
EP-KIT51	6 - 2-part sealant sets (part A & B); 1 - putty stick (7 in/18 cm); 12 - Type RP cleaning wipes (cat # RP-1); 6 - sandpaper strips (24 in/61 cm); 12 - mixing sticks; 6 - pairs of gloves; 1 - instruction sheet	1

SPECIFICATIONS AND APPLICATIONS:

- **Electrical Reliability:** Moisture can damage transformers. Sealing leaks quickly as they occur is the key to keeping moisture from entering transformers and causing premature or catastrophic failure.
- **Chemical Resistance:** Sealant chemically resists dielectric fluids, SF6 gas, ultraviolet light, water, and oil.
- **Leak Sealing Performance:** Sealant shows good adhesion to numerous metals, ceramics, and rubbers; and no leakage under high pressure (up to 100 PSI) with both air and polybutene oil.
- **Electrical Testing:** Sealant is non-conductive. Dielectric strength is 43 kV using ASTM D149, Method A. Platen samples are cast and fully cured.

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American Polywater

powerpatch®

Leak Repair System
For
PILC (Paper Insulated Lead Cables)

Before ***After***





Features

Eliminate Hazardous Alternative Methods - Kit will eliminate lead wiping and heat sources in manhole.

Convenient - Kit contains all materials needed to fix leak while in the field.

Quick plugging action - Fast cure putty stops oil seepage.

Permanent seal - A quick curing 2-part paste overcoat forms a permanent seal.

Durable - Finished seal is impervious to water, oil and weather.

Fast - System can plug and seal active leaks in minutes.

PowerPatch® System

System contains necessary cable prep material for cleaning and sealing of cable. Use the PowerPatch® System's 2-part putty stick to block oil leaks. Then make a permanent patch with the fast cure, 2-part paste overcoat. Optimal mix and performance is ensured with pre-measured packaging.

Seals cracks and punctures in hard to reach areas. Fixes leaks fast. At 70°F, the putty and sealant harden in about 10 minutes. Repairs made at temperatures as low as 40° F have a slower cure. The finished patch is resistant to transformer oil and water and has held oil pressures in excess of 20 psi on lead.

Preparation is important, and the kit approach provides everything needed to do the job. Read detailed application instructions before using.

PowerPatch® Sealant Physical Properties

Color: Dark Grey
Viscosity: No-Sag, Thick Paste
Pot Life: 5 minutes @ 70°F/ 21°C
Dielectric Strength: 41 KV (ASTM D 149)
Cured Hardness: 75 (Shore D)
Durability: Resistant to UV, water, and oil
Adhesion to Metals: Good
Adhesion to Ceramic: Excellent

PowerPatch® Kit

The PowerPatch® Sealant is provided in a kit containing the preparation and patching materials necessary to repair oil leaks in transformers, lead-sheathed cables, potheads and other oil-filled, electrical equipment. Kits can be customized to end-user requirements.

Product Code	Description
EP-Kit11	**Contains**: 2 Part Sealant (Part A & B), Putty Stick (3-1/2"), 2 RP™ Cleaning and Preparation Wipes, 24" Sandpaper Strip, 2 Mixing Sticks, 1 Pair of Gloves, and Instructions. Single Use.
EP-Kit51	**Contains:** 6 sets 2 part Sealant (Part A&B), Putty Stick (7"), 12 RP™ Cleaning and Preparation Wipes, 6 Strips Sandpaper (24"), 12 Mixing Sticks, 6 Pairs of Gloves, and Instructions. Seals multiple leaks.
EP-KITB12	**Contains:** Twelve sealed plastic bags, each with 2-part sealant (part A & B), putty stick (~2"), 2 Type RP™ Cleaning and Preparation Wipes, 12' sandpaper strip, 2 mixing sticks,1 pair gloves, and instructions. Box of 12 Single-use kits
EP-KIT51	**Contains:** 6 sets 2 part Sealant (Part A & B), Putty Stick (~7"), 12 RP™ Cleaning and Preparation Wipes, 6 Strips Sandpaper (24"), 12 Mixing Sticks, 6 Pairs of Gloves, and Instructions. Seals multiple leaks.

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LIT-POWERPATPILC/REV000

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Leak Repair

TECHNICAL DATA SHEET

Description:

The PowerPatch® Leak Repair System provides fast and effective “in-field” leak repair for transformers, PILC cables, and other oil and gas insulated electrical equipment.

Once a leak has been temporarily stopped using the two-part Putty, the Sealant is applied and cures to form a strong, durable patch. The PowerPatch® Sealant is the functioning patching material.

PowerPatch® System is supplied with all the materials required to seal electrical insulating oil and gas leaks. The sealant bonds to polyethylene, lead, aluminum, ceramic and steel.

Leak Sealing Performance:

To test gas pressure sealing, a 1/16-inch hole was patched. The surface was prepared and sealant applied and cured according to the instructions. The repair was then subjected to continuous air pressure for 24 hours.

Surface	Pressure	Result
Steel	200 psi	No Leaking
HDPE (cable jacket)	80 psi	No Leaking
Lead	50 psi	No Leaking

To evaluate oil leak sealing, a seeping oil leak from a 1/8-inch hole in a galvanized pipe was repaired using standard procedures. The oil pressure in the pipe was then increased and held at 100 psi.

Continuous Pressure	One Month Aging With Polybutene Oil
100 psi	No Leaking

PowerPatch® Sealant shows good adhesion and no leakage under high pressure with both air and polybutene oil.



The PowerPatch® Leak Repair System provides a fast and easy in-field leak repair system.

Product Benefits:

- Quick plugging action
- Easy to use, fast repair time
- Long-lasting seal
- Durable- withstands environmental extremes
- Resistant to oils, water, and uv
- Prevents water entry into oil-filled equipment
- No bagging necessary to catch oil
- Convenient, field-ready kit

Typical Applications:

PowerPatch® Sealant repairs oil and SF_6 filled systems and restores electrical integrity to:

- Transformers
- Switchgear
- Terminations
- PILC Cables

Component Physical Properties:

PowerPatch® is a 2-part sealant, ready to mix for field use.

Property		Part A (Resin)	Part B (Curing Agent)
Color		Black	White
Form:	*Cups*	Thick Paste	Thick Paste
	Cartridge	Thick Gel	Thick Gel
VOC Content		0 g/L	0 g/L
Specific Gravity		1.7	1.4

Cured Properties:

PowerPatch® Sealant cures to form a solid patch. Pre-measured packaging contains enough material to seal one typical leak, ~ 6 in^2 at ¼-inch thickness.

Property	Typical Result
Color	Dark Grey
Peak Exotherm @ 70° F	< 200°F
Hardness 7 Days @ 70° F (Shore D Durometer)	75
Flexural Stress (ASTM D790)	6,925 lb_f/in^2
Flexural Strain (ASTM D790)	1.43 X 10^{-2} in/in

Typical Peel Strength:

Substrate	Result
Galvanized Steel (180°)	>100 pli
Aluminum (180°)	>100 pli
Lead (180°)	16.5 pli
Copper (180°)	>100 pli
Stainless Steel (180°)	>100 pli
HDPE (90°)	49 pli
PVC (90°)	46 pli
Ceramic (90°)	> 100 pli

Tested using ASTM C794. Samples are sanded, cleaned and allowed to cure for 24 hours.

Typical Shear Strength:

Substrate	Result
Steel	> 1,000 lbs/in^2
Aluminum	> 1,000 lbs/in^2
Polyethylene	114 lbs/in^2
PVC	148 lbs/in^2

Tested using ASTM D1002. Samples are sanded, cleaned and allowed to cure for 24 hours.

Typical Impact Resistance:

Substrate	Result
HDPE	55 in-lbs
Lead	65 in-lbs
Steel	95 in-lbs

Tested using ASTM G14. Samples are sanded, cleaned and allowed to cure for 24 hours.

Electrical Testing:

PowerPatch® Sealant is non-conductive. Dielectric strength was tested using a 2,000 volts/second rate of rise and type 3 circular electrodes with a 0.25-inch diameter. All tests were performed in insulating oil to prevent discharges and flashovers. Results are the average of 10 trials.

Sample Thickness	Breakdown Voltage	Dielectric Strength
0.0916 Inch	43 kV	469 Volts/Mil

Tested using ASTM D149, Method A. Platen samples are cast and fully cured.

Chemical Resistance:

PowerPatch® Sealant chemically resists dielectric fluids, SF_6 gas, ultraviolet light, water, and oil.

ASTM D1002 was used to test the shear adhesive strength of the PowerPatch® Sealant on steel after exposure to the reagent. The sample was allowed to cure 7 days, then was immersed in the reagent and aged at 50°C for 6 months. Shear adhesion was compared to a control that was air aged.

Fluid*	Appearance (6 months)	Comparison to Control
Mineral Oil	No Change	100% (Pass)
Polybutene Fluid	No Change	100% (Pass)
Hydrocarbon Fluid	No Change	100% (Pass)
Silicone Oil	No Change	100% (Pass)

**Mineral Oil (Holland 70), Polybutene (Duddek PLIC), Hydrocarbon Fluid (Bio Temp), Silicone Oil (GE Silicone SF 96-100)*

Application:

PowerPatch® Sealant is easy to use. For full installation information, please see PowerPatch® Instructions: Cartridge Application or Mixing Cup Use. *(See www.polywater.com/powerpatch.asp)*

In cold weather, materials should be kept as warm as possible. Store materials in a warm vehicle and use chemical warming pad to increase the temperature of the repair area.

Cure Rate:

Recommended application temperature is 40° F to 120° F. Cure rate depends on temperature.

Temperature	Working Time	Functional Cure
35° F	40 Minutes	7 Hours
52° F	20 Minutes	3½ Hours
60° F	10 Minutes	1½ Hours
70° F	6 Minutes	60 Minutes
88° F	4 Minutes	40 Minutes

PowerPatch® Sealant is available in a slower-cure rate for larger applications that require more work time. (Product Code EPSC)

An oil pressure test was used to determine effective seal time under ambient conditions.

Aging Condition	Result
Ambient (70° F)	Holds 20 psi oil pressure after 15 minutes

Seal sets in less than 10 minutes at this temp.

Vertical Sag:

PowerPatch® Sealant clings to vertical surfaces and other non-horizontal angles common in field repairs. Once applied, it stays in place.

In this test, the PowerPatch® Sealant is mixed and applied to a vertical metal platen. Displacement is measured and recorded.

Temperature	Displacement from Center
60°F	0 inches
75°F	1/16 inch
95°F	3/32 inch
110°F	3/16 inch

PowerPatch® Paste shows minimal sag within a large temperature range.

Paint Adherence:

PowerPatch® Sealant can be painted 15 minutes after application. In this test, the paste is applied, painted and the paint is allowed to dry for 24 hrs. Then, a cross-cut tape test is run.

Paint Type	Results
Enamel Paint	0% Paint Removed
Alkyd Paint	0% Paint Removed

Tested using ASTM D3359, Test Method B.

Both paints adhere well to the PowerPatch® Sealant.

Environmental Resistance:

Temperature Range:

Application: 40° F to 120° F
In Use: -40°F to 400°F

Temperature Cycle Testing:

Ten cycles at -22° F to 203° F showed no significant change in adhesion as shown below.

Material	Adhesion Compared to Non-Aged Control
Galvanized Steel	100 % (Pass)
Aluminum	100 % (Pass)
Ceramic	100 % (Pass)
Copper	100 % (Pass)
Stainless Steel	100 % (Pass)
Lead	100 % (Pass)

PowerPatch® Sealant is resistant to ultraviolet exposure and withstands direct sunlight with no decrease in functionality.

PowerPatch® Sealant has been outside aged for over five years with a temperature range from -25° F to 110° F. Conditions include rain, snow and sleet as well as exposure to direct sunlight. PowerPatch® shows no deterioration and cannot be physically pried from the surface. It shows only slight discoloration (<1/16" thickness).

Safety:

PowerPatch® Sealant has a low level of toxicity. Follow good industrial hygiene practice during use. Avoid vapor inhalation and personal contact with the product. Use ventilation or respiratory protection against decomposition products during welding/flame operations on or near cured product (e.g., torches used to install heat shrink products). See SDS for specific details.

Storage and Handling:

Keep containers cool, dry and away from sunlight. Keep containers tightly closed.

Product shelf life is 15 months.

Model Specification:

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

Approved electrical repair compound is PowerPatch® Sealant. The electrical repair compound shall come in a system that contains everything needed for the repairs. The system shall contain an oil block to allow repairs on an active oil leak. The sealant shall not sag during cure so that it may be applied to the bottom side of leaking surfaces without running or dripping.

The adhesive repair patch shall have excellent adhesion to a variety of substrates with minimum peel strength of 100 pli on stainless steel, copper, and ceramic; and 40 pli on polyethylene when measured by ASTM C 794. The adhesive repair patch will retain 100% of peel strength adhesion after 5 freeze/thaw cycles and shall withstand in-use temperatures from -50°F to 250°F.

The adhesive repair patch shall seal mineral oil and polybutene dielectric fluid at up to 200 psi oil pressure without leakage. The cured repair patch shall be impervious to water, salt water, oils, and dilute acids and bases. It shall have a minimum flexural strain of 1.1 in/in as measured by ASTM D790.

The adhesive patch shall not contain any metals and shall not corrode. It shall be non-conductive with a minimum dielectric breakdown voltage of 40 kV as measured by ASTM D 149.

Order Information:

Cat #	Package Description
EPCT-KIT1 Multi-Use Cartridge Kit	2 PowerPatch® Sealant 2-part Cartridges 4 Static Mixers 2 Putty Sticks (1-3/4" ea) 8 Type RP Cleaning and Preparation Wipes 24" Strip Sanding Cloth 4 Application Sticks 1 Instruction sheet
EPCT-KIT1G	EPCT-KIT 1 with Application Tool
EPCT-KITB6	Contains: 6 EPCT-KIT1
EPCT-KITB6G	Contains: 6 EPCT-KIT1 with application tool TOOL-50-11
TOOL-50-11	Application Tool to dispense cartridge package, EPCT
EP-KIT11 Single-Use Kit	2-Part PowerPatch® Sealant(parts A and B) 1-3/4" Putty Stick 2 Type RP Cleaning and Preparation Wipes 12" Strip Sanding Cloth 2 Mixing Sticks 1 Pair disposable gloves 1 Instruction sheet
EP-KITB6	Box of 6 Single-Use Kits, EP-KIT11
EP-KITB12	Box of 12 Single-Use Kits, EP-KIT11
EP-KIT51	6 sets Part A and B PowerPatch® Sealant 7" Putty Stick 12 Type RP Cleaning and Preparation Wipes 6 24" Strips Sanding Cloth 12 Mixing Sticks 6 Pairs disposable gloves 1 Instruction sheet
***Custom kits available. Call factory for details.*	
***Slower curing version PowerPatch® Sealant available (EPSC). Call factory for details.*	

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LIT-EPSPEC/REV001

Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ Software

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Polywater® Pad N Pole™

UTILITY ENCLOSURE REPAIR SYSTEM



Finished Pad N Pole repair

For Field Repair of Utility Enclosures, Poles, and Pedestals

PRODUCT BENEFITS

- **Protects:** Seals defects from unwanted entry.
- **Prevents:** Helps stop outages and costly changeouts.
- **Durable:** Withstands environmental extremes. Sunlight (UV) resistant.
- **Versatile:** Repairs damage of various shapes and sizes.
- **Easy to Use:** Kit contains materials to complete repair in a single visit.

Restores System Integrity

Polywater® Pad N Pole™ (BRK™) fixes and restores damaged utility enclosures to prevent human, water, and pest intrusion. Polywater Pad N Pole two-part adhesive bonds to fiberglass, steel, polyethylene, metal, concrete, and composites. The resin repair system provides a durable, long-lasting repair.



Clean and sand before applying BRK



Wet the fabric with BRK



Kit components



Painted BRK repair

Multi-use Cartridge Creates Numerous Repairs

Polywater Pad N Pole Repair is supplied in kits that contain everything needed for a repair. A standard high-ratio caulking gun can be used to dispense product.

POLYWATER PAD N POLE

Catalog #	Package Description	Units/Case
BRK-250KIT1	1 250mL PowerPatch Pad N Pole Repair adhesive cartridge 6 mixing nozzles 1 strip of sanding cloth 6 HP™ cleaning/drying wipes (HP-P158ID) 6 pairs of disposable gloves 6 foam brushes 1 72”x6” fabric 1 instruction sheet (dispensing tool not included)	1
BRK-250KITB6	Contains 6 BRK-250KIT1	1
TOOL-250	Dispensing tool	1

SPECIFICATIONS AND APPLICATIONS:

- Repairs made with Polywater Pad N Pole Repair withstand exposure to extreme outdoor temperatures, from -60° F to 180° F.
- Polywater Pad N Pole fixes a wide variety of defects, from small cracks to large holes. Multiple layers can be applied for increased strength over large areas.
- Polywater Pad N Pole Repair is quick and easy to install. Polywater Pad N Pole mixed resin has 30 minutes working time. It can be painted immediately after application, eliminating the need for a return visit. Repairs reach full strength in 12 hours.

CONTACT US

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American Polywater® Corporation

11222 60th Street N | Stillwater, MN 55082 USA

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Pad N Pole™ Repair

TECHNICAL DATA SHEET

Description:

The PowerPatch® Pad N Pole™ Repair system repairs and restores damaged utility enclosures, preventing human, water, pest or debris entry through the repaired area.

The PowerPatch® Pad N Pole™ two-part adhesive bonds to fiberglass, polyethylene, metal, concrete and composites. Fiberglass cloth (saturated with the adhesive) provides structural integrity for a durable, long - lasting repair.

PowerPatch® Pad N Pole™ Repair comes in a kit that contains everything needed for a repair. The adhesive is easy to dispense and quickly wets the fiberglass cloth. The fiberglass can be layered as necessary to create a thicker and stronger structure. Repairs are quick and easy, and can be done in the field with a single visit with little or no training.

Performance:

Repairs made with PowerPatch® Pad N Pole™ Repair withstand exposure to extreme outdoor temperatures, from -60° F to 200° F.

PowerPatch® Pad N Pole™ Repair is versatile with optional use of single or multiple layers of fiberglass material. Multiple layers are appropriate for increased strength over larger defects. A wide variety of defects from small cracks to holes up to six inches in diameter can be repaired.

PowerPatch® Pad N Pole™ Repair is quick, and many defects can be repaired in as little as 3 minutes. The PowerPatch® Pad N Pole™ mixed resin has 30 minutes working time. It can be painted immediately after application, so no return visit is needed. Repairs reach full strength in 12 hours.



Fiberglass cloth saturated with the high-strength, two-part resin makes the permanent PowerPatch® Pad N Pole™ Repair.

Product Benefits:

- Seals defects from unwanted entry
- Easy to use - quick repair
- Protects and seals enclosure
- Sunlight (UV) resistant
- Withstands environmental extremes
- Multiple use, field-ready kit
- Complete field repair in a single visit

Typical Applications:

PowerPatch® Pad N Pole™ Repair may be used on a variety of outdoor enclosures including:

- Transformer Pads & Enclosures
- Lighting Pedestals
- Telecom Junction Enclosures
- Above Ground Conduits

Component Physical Properties:

The PowerPatch® Pad N Pole™ adhesive is a 2-part, thixotropic paste packaged in a cartridge applicator. The supplied mixing nozzles ensure proper mixing as the product is extruded from the cartridge.

Property	Part A (Resin)	Part B (Curing Agent)
Color	Beige	Amber
Form	Thick Paste 700,000 cps	Liquid 900 cps
Odor	No Odor	No Odor
Specific Gravity (water = 1)	0.96	1.21

Typical Properties:

PowerPatch® Pad N Pole™ adhesive cures to form a solid, durable seal.

Property	Typical Value
Color	Beige
Peak Exotherm @ 70º F	< 110º F
Hardness 7 Days @ 70º F (Shore A Durometer)	90
Flexibility 7 Days @ 70º F	Excellent
Tensile Strength (lap shear adhesion, Aluminum @ 77º F)	1400 lbs/in^2
Dielectric Strength (ASTM D149)	450 Volts/Mil
Peel Adhesion (ASTM D1876)	34.3 lbs/in
Impact Resistance (ASTM G 14): On Fiberglass	>100 in-lbs
On Galvanized Steel	>100 in-lbs
On Polyethylene	>100 in-lbs

Materials:

PowerPatch® Pad N Pole™ Repair adheres to:

- Fiberglass
- Steel
- Composites
- PVC
- Polyethylene
- Concrete
- Aluminum
- Copper

Environmental Resistance:

PowerPatch® Pad N Pole™ Repair withstands the typical rigors of an outdoor environment.

It shows no significant change in adhesion in temperature cycle testing (0° F/130° F for 10 cycles).

It shows no significant change in adhesion in 12 month exposure to sunlight (some darkening of color).

Chemical Resistance:

The chemical resistance of a stainless steel screen to fiberglass bond (with the Pad N Pole™ adhesive) was tested by comparing peel adhesion after reagent immersion to non-immersed adhesion. Samples were immersed in the reagent at 70° F for 3 months.

Chemical Exposure	Percent of Control
Salt Water (4%)	95%
Alkaline Soap Solution (pH = 12)	100%
Odorless Mineral Spirits	90%

The PowerPatch® Pad N Pole™ Repair shows good resistance to salt water, alkaline soap solutions and mineral spirits (paraffinic solvent).

Application:

PowerPatch® Pad N Pole™ Repair is easy to use.

If necessary, dig out sod and soil to reveal at least 2 inches of undamaged surface around the defect. Abrade the area to be repaired approximately 1½ inches around the damage using the abrasive cloth included in the kit. Clean and dry the abraded area with the Type HP™ Tandem Pack™ (HP-P158ID), removing all dirt and other contaminants. As in any repair involving adhesive application, starting with a clean surface is very important.

Cut the fiberglass cloth to overlap the damage by approximately 1 inch past its borders. Generously apply the two-part Pad N Pole™ adhesive to the cleaned surface around the damaged area. Lay the fiberglass fabric over the damaged area, pressing the edges into the Pad N Pole™ adhesive. Smooth and press down with the foam brush. The patch will cling to the adhesive covered area and quickly saturate with the Pad N Pole™ adhesive.

Generously apply additional Pad N Pole™ adhesive to the top of the fiberglass cloth (including the cloth over the hole) and smooth with the brush until the cloth is fully saturated. Brush the Pad N Pole™ adhesive ½ inch past the edges of the cloth, feathering the resin and ensuring that the edges of the cloth are well adhered to the surface. Pad N Pole™ adhesive will set in about 30 minutes and reach full strength in about 12 hours.

Larger repairs (> 2") will benefit by adding additional layers of cloth material. Additional layers can be added at any time, before or after the first layer has cured.

The repair area may be spray painted immediately (before full cure), and soil may be replaced at this time, enabling even a complex repair to be done in a single visit.

For additional installation information, please see the Pad N Pole™ usage instructions at:
www.polywater.com/BRKinstructions.pdf

Cure Rate:

PowerPatch® Pad N Pole™ adhesive has a working time of 30 minutes at 70° F, allowing ample time to perform repairs with care and precision. After thickening beyond the point that it can be spread, the product continues to cure, reaching maximum strength in 12 hours at 70° F.

Working and set time variation with temperature is shown below.

Temp.	Working Time	Set Time
40° F (4° C)	90 Minutes	24 Hours
52° F (11° C)	70 Minutes	20 Hours
60° F (16° C)	40 Minutes	16 Hours
70° F (21° C)	30 Minutes	12 Hours
88° F (31° C)	20 Minutes	8 Hours

Storage and Handling:

Keep cartridge tightly closed in a cool, dark, dry location. Reseal cartridge after use. All cartridges should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

Unopened product has a shelf life of one year.

Safety:

PowerPatch® Pad N Pole™ Repair has a low level of toxicity. Use good industrial hygiene practice, and follow any precautions during use. Avoid personal contact with the uncured product. See SDS for specific details.

Model Specification:

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

The approved enclosure repair system is PowerPatch® Pad N Pole™ Repair. The repair system shall come in a multiple-use kit that will provide the materials needed for the repair.

The packaging shall automatically mix and meter the two-part repair adhesive. The cure rate of the adhesive shall allow 30 minutes of working time (at 70° F) to apply and smooth the repair. The repair shall be spray paintable immediately after application with no reduction in ultimate strength. Product shall be suitable for use on various enclosure materials, including fiberglass, HDPE, concrete, steel, aluminum, and composites.

Once cured, the repair shall be watertight. The bond shall be strong enough to withstand an impact of over 100 in-lbs on fiberglass as measured by ASTM G14.

The cured product shall be resistant to water, salt water, oils and ultraviolet degradation. The cured bond shall withstand temperature extremes from -60° F to 200° F. It shall withstand multiple freeze-thaw cycles. The cured product shall be non-conductive with a minimum dielectric strength of 450 Volts/Mil as measured by ASTM D149.

Order Information:

Cat #	Package Description
BRK-KIT (1 unit/case)	Kit contains: 1 PowerPatch® Pad N Pole™ Repair Adhesive Cartridge 6 Mixing Nozzles 1 Strip of Sanding Cloth 1 Pair Disposable gloves 6 HP™ Tandem Cleaning and Drying Wipes (HP-P158ID) 6 Foam Brushes 1 Square Foot Patch Material 1 Instruction Sheet (Dispensing tool not included.)
BRK-KITG (1 unit/case)	Contains 1 BRK-KIT and 1 Dispensing Tool
BRK-KITB6 (1 unit/case)	Bulk kit contains 6 Individual Kits, BRK-KIT (Dispensing tool not included.)
BRK-KITB6G (1 unit/case)	Bulk kit contains 6 Individual Kits, BRK-KIT 1 Dispensing Tool Included
TOOL-50-21 (1 unit/case)	1 Dispensing Tool

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Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ Software

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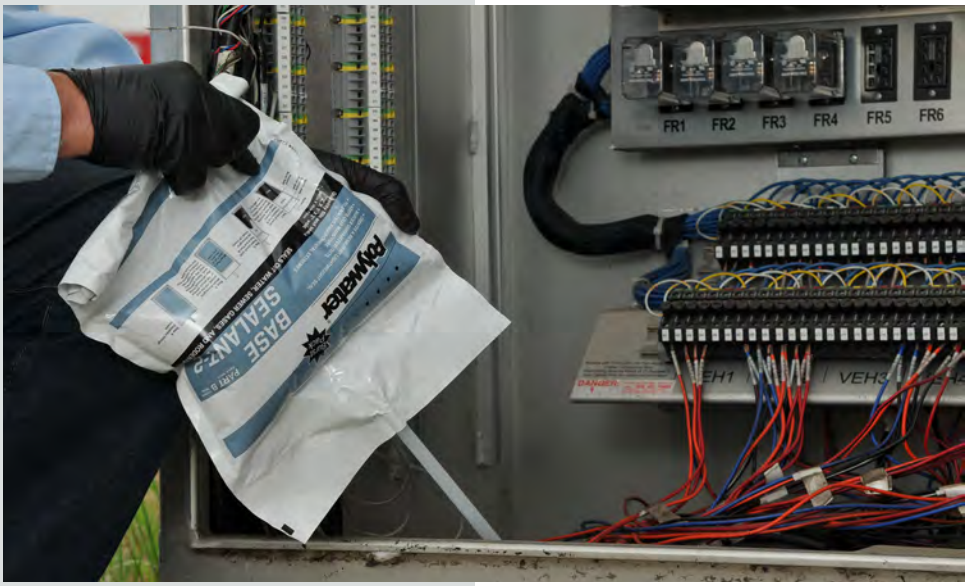
Polywater® InstaGrout™

UTILITY PAD SEALANT BARRIER



Deploying InstaGrout using the burst pack

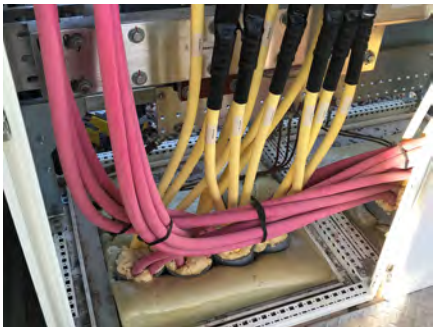
Pour-In Sealant Barrier that Prevents Costly Outages

PRODUCT BENEFITS

- **Deterrent:** Keeps rodents, snakes, insects, and water from entering enclosures.
- **Easy to Use:** Ready to mix and apply. No water needed.
- **Blocks:** Flows and self-levels before expansion to seal the entire opening.
- **Re-enterable:** Saw or drill after installation to install new ducts or cables.
- **Protects:** Offers permanent protection through weather extremes or change-outs.

Safeguard Enclosures and Equipment from Damage

Polywater® InstaGrout™ Sealant is a two-part urethane foam that seals out pad-mounted equipment openings to prevent outages and service disruptions. Safer to use and more effective than concrete grout. InstaGrout will not collapse during change-outs and adheres to various pad-mounted materials.



Completed installation in solar inverter



Completed installation in transformer pad

polywater.com | 651-430-2270

American Polywater® Corporation



Catalog # PMT-2



Catalog # PMT-10

Convenient Kits for Easy Installation

Polywater InstaGrout Sealant Barrier is supplied in kits that contain everything needed for an excellent seal, including resins, burst packs, mixing pails, gloves, and instructions.

The PMT-1 and PMT-2 burst packs make sealing openings easy. Perfect for congested areas or smaller voids in transformer pads. The two parts are conveniently mixed inside the flexible package once the center seal is broken. The resin is then deployed into the duct through the mixing nozzle.

The PMT-3 and PMT-10 contain premeasured containers of the two-part curing resin and hardener. These packages are for sealing larger openings in transformers, switchgear, sectionalizing cabinets, and inverters.

POLYWATER INSTAGROUT

Catalog #	Package Description	Units/Case
PMT-1	1 – 750-mL burst pack; 1 – pair of gloves; 1 – instruction sheet *Kit covers 1 square foot (approx.) at a three-inch depth/930-cm² at 7.6 cm depth.*	2
PMT-2	1 – 1500-mL burst pack; 1 – pair of gloves; 1 – instruction sheet *Kit covers 2 square feet (approx.) at a three-inch depth/1860-cm² @ 7.6 cm depth*	2
PMT-3	1 – bottle part A; 1 – bottle part B; 1 – mixing pail; 1 – mixing stick; 1 - pair of gloves; 1 – instruction sheet *Kit covers 3 square feet (approx.) at a three-inch depth/2790 cm² at 7.6 cm depth*	1
PMT-10	1 – jug part A; 1 – jug part B; 1 – mixing pail; 1 – pair of gloves; 1 – instruction sheet *Kit covers 10 square feet (approx.) at a three-inch depth/9290 cm² at 7.6 cm depth*	1

SPECIFICATIONS AND APPLICATIONS:

- **Material Compatibility:** Polywater InstaGrout Sealant is compatible with cable jacket materials, conduits, and various transformer pad materials. The foam is an inert solid that will not attack the jacket material.
- **Adhesion:** Polywater InstaGrout Sealant has good adhesion to a variety of materials found in electrical cabinets, including PVC, copper, aluminum, fiberglass pads, polymer concrete pads, polyester, and polyethylene.
- **Water and Chemical Resistance:** Polywater InstaGrout Sealant does not absorb water and is chemically resistant to gasoline, oils, dilute acids, and bases.

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InstaGrout™ Sealant

American Polywater® Corporation

TECHNICAL DATA SHEET

Description:

Polywater® InstaGrout™ Sealant creates a barrier to protect transformer pads, J boxes, control cabinets, and switchgear base openings. Polywater® InstaGrout™ keeps out moisture and stops rodents, snakes, spiders and insects such as wasps and fire ants from burrowing up through earthen gaps into the pad enclosure, potentially causing costly outages or safety hazards to crews. The strong, lightweight seal withstands freeze-thaw cycles and environmental extremes. It is compatible with cable jacket materials and will not corrode metal.

InstaGrout™ Sealant is packaged in pre-measured kits for easy, on-site mixing. It flows around cables, conduits and other complex geometry. InstaGrout™ Sealant adheres to metals, plastics, wood and concrete, creating a permanent, but re-enterable barrier.



InstaGrout™ Sealant is used to fill a transformer cabinet base in place of concrete.

Self Leveling Application:

InstaGrout™ Sealant is easy to install because it flows into the target area before expanding.



InstaGrout™ is mixed and poured

InstaGrout™ fills in irregularities of the surface on which it is applied and finds its way between the maze of conduits and cables that complicate the application of grouts and other systems.



It flows and expands after 20 minutes

InstaGrout™ is engineered with a time delay that allows this flow before it expands and reacts into its final, durable form. It will naturally flow into small spaces and does not require troweling.

Product Benefits:

- Keeps out rodents, snakes and insects
- Creates a strong, resilient, lightweight seal
- Self levels and flows before expanding.
- Easy to mix and apply; *no water required*
- Tolerates environmental extremes
- Sturdy, cross-linked structure will not crumble or cave-in like concrete grout
- Compatible with cable jacket materials

End Use:

InstaGrout™ Sealant creates a strong base that can:

- Be used for minor repairs or large areas
- Fill and block openings and channels
- Level transformer bases

Component Properties:

Polywater® InstaGrout™ Sealant is a two-part, reactive system. It is a slightly gelled liquid for use with manual mixing.

Property	Part A (Resin)	Part B (Curing Agent)
Color	Brown	Gray
Form	Viscous Liquid 300 cps	Viscous Liquid 1,100 cps
Specific Gravity	1.24	1.07
VOC Content:	0 g/L	0 g/L

Cured Properties:

Polywater® InstaGrout™ Sealant cures to form a solid, closed cell matrix.

Property	Typical Result
Appearance	Light gray with small, even cells
Closed Cell Content	98%
Density	8 lbs/cu. ft.
Compressive Strength (ASTM D1691)	615 psi
Seal Strength Water	1 foot continuous,
Seal Strength Air	1 psi
Dielectric Value (ASTM D149)	61 V/mil

Material Compatibility

Polywater® InstaGrout™ Sealant is compatible with cable jacket materials. The foam is an inert solid that will not attack the jacket material.

Chemical Resistance

Polywater® InstaGrout™ Sealant is chemically resistant to gasoline, oils, dilute acids and bases, and most unsaturated hydrocarbons.

Adhesion:

Polywater® InstaGrout™ Sealant has good adhesion to a variety of materials found in control cabinets.

InstaGrout™ Sealant is cured around a one-inch bar at a depth of 1.5 inches. Force required to remove bar is measured. Adhesion is calculated based on seal surface area.

Material	Adhesion	Value
PVC	Excellent	100 lbs/ sq. in
Copper	Excellent	90 lbs/ sq. in
Aluminum	Excellent	95 lbs/ sq. in
HDPE	Good	25 lbs/ sq. in

Water Resistance:

Polywater® InstaGrout™ Sealant does not absorb water. To test water blocking performance, InstaGrout™ is installed into a PVC conduit, forming a 3-inch plug. Water is added to the system, and then pressurized to create a “water-head”.

Condition	Result
PVC Conduit	Holds 10 psi, 7 days (22.5 feet water)

InstaGrout™ Sealant will keep water out if it is properly installed with good seal at all the edges.

Environmental Resistance:

Polywater® InstaGrout™ Sealant withstands the rigors of the environment.

Temperature Use Range
-20°F to 200°F (-29°C to 93°C) Continuous
-40°F to 250°F (-40°C to 121°C) Peak

Polywater® InstaGrout™ Sealant withstands direct sunlight with no decrease in functionality. Surfaces exposed to UV will discolor and yellow. The cured product retains its hardness and continues to act as a barrier. Discoloration will not harm the performance of the material.

InstaGrout™ Sealant may also be protected with a weather proofing paint or coating. Acrylic, urethane and epoxy based products have excellent adhesion to the foam.

Application:

Field-Ready Kits
Polywater® InstaGrout™ Sealant is a two-part system packaged in pre-measured quantities for easy, on-site mixing.

Application Temperature

Working temperature for Polywater® InstaGrout™ Sealant is 35°F to 110°F (4°C to 43°C).

Usage Quantity

Carefully measure the area to be sealed by multiplying the width by the length of the opening pad in the structure. Do not subtract any conduits or other stub-up utilities. Use this measurement to estimate the minimum quantity required. Round up to determine quantity of InstaGrout™ Sealant required. It is best to use field measurements rather than measurements from plans or specs to calculate your job quantity. The openings to be filled in the field may not have the same dimensions as the drawing.

Example: Pull box measuring 15 inches (1.25 feet) by 36 inches (3 feet).

- *Pull box area is 3.75 square feet.*
- *Seal requires one PMT-3 Kit and one PMT-1 Kit to cover 4 square feet at 3 inches. The additional PMT-1 will fill any holes or gaps left after the application of the PMT-3 Kit.*

Kit Size	Area Coverage (3-inch depth)	Volume Coverage
PMT-1	1 square foot	0.25 ft^3
PMT-3	3 square feet	0.75 ft^3
PMT-10	10 square feet	2.5 ft^3

Area Preparation and Application

Prepare target area by filling holes and leveling the surface. Cover pea-gravel with one inch sand or dirt. Mix two parts well for at least 30 seconds until the product is a uniform gray color. Slowly pour onto target surface.

For full installation information, please see the InstaGrout™ Installation Instructions.
(www.polywater.com/PMTinstructions.pdf)

Re-entering:

Additional conduits or cables may be passed through InstaGrout™ Sealant with relative ease. Cured InstaGrout™ Sealant may be drilled with auger bits or hole saws designed for wood. The overall integrity of the seal allows such drilling without collapsing the seal, which may be seen with grout. Simply drill through the InstaGrout™, and pass through the conduit or cable. Once the new conduit or cable is in place, an additional application of InstaGrout™ can reseal the area against future intrusion.

Cure Rate:

Application Temperature
Polywater® InstaGrout™ Sealant will set up and cure more quickly in warm temperatures.

Temperature	Seal Formation	Full Cure
35°F	1 hour	12 hours
70°F	20 minutes	4 hours
110°F	8 minutes	2 hours

Safety:

Polywater® InstaGrout™ Sealant is a two-part urethane containing highly reactive chemicals. Polyurethanes are common in the construction industry and have been used for many years. Some individuals may become sensitized to components in the unreacted resin. Precautions must be observed during use and handling of these materials.

The use of Polywater® InstaGrout™ Sealant in the prepackaged containers controls and reduces exposure. Use of protective gloves and eyewear is recommended. Once reacted, the foam is a solid, closed-cell polyurethane. The finished product may be considered non-toxic. See SDS for more information.

Clean-up

Any unreacted material may be cleaned from surfaces with Polywater's Grime-Away™ Multipurpose Cleaner. Reacted material must be removed mechanically by scraping or sanding.

Storage and Handling:

Keep containers cool, dry and away from sunlight. Leave cartridges in the protective foil pouch until ready to use/reuse.

Product shelf life is one year.

Order Information:

Cat #	Package Description
PMT-1 (covers **one** ft^2 at 3-inch depth)	1 Bottle Part A 1 Bottle Part B 1 Pair Gloves Instruction Sheet
PMT-3 (covers **three** ft^2 at 3-inch depth)	1 Bottle Part A 1 Bottle Part B 1 Pair Gloves 1 Mixing Pail 1 Mixing Stick Instruction Sheet
PMT-10 (covers **ten** ft^2 at 3-inch depth)	1 Jug Part A 1 Jug Part B 2 HTC-1 (Grime-Away™ Wipes) 1 Pair Gloves 1 Mixing Pail Instruction Sheet *(recommend using a drill paint mixer to mix)*

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Polywater® UPR™

UTILITY WOOD POLE REPAIR



UPR NF application

Expanding Sealant Repairs Woodpecker Damage in Wood Poles

PRODUCT BENEFITS

- **Expands:** Completely fills irregular-shaped cavities.
- **Adheres:** Integrates with wood.
- **Hardens:** Cures to the strength of wood poles.
- **Gaffable:** Will hold climbing gaffs.
- **Quick Mixing:** Two-part formula mixes in nozzle when applied.

Extends Pole Life

Polywater® UPR™ Utility Pole Repair makes it easy to repair woodpecker damage and pole line hardware holes on utility poles. The UPR Utility Pole Repair resin and hardener are specially formulated to expand and fill irregular-shaped cavities to protect poles from rot.



UPR PR application



UPR NF 600-mL cartridge application



UPR-NFKIT12 kit components


UPR-NF6B10 kit components

Multiple Packages for All Applications

UPR comes in two types. The “NF” is a quick-gel version that will not leak or drip out of wood cracks at the bottom of the hole. The “PR” version is a liquid formula that flows around wood block fillers to save material.

To fix one “football-sized” hole on a pole, order the UPR-NFKIT4 or UPR-PRKIT3. For multiple holes, large nesting cavities, or transmission line jobs, order the UPR-NFKIT12 or UPR-PRKIT12.

UPR is packaged in kit form with everything needed to do the repair, including additional mixing nozzles for multiple repairs. Most UPR kits can be applied with a standard high-ratio caulking gun. Partially used cartridges can be resealed and reused with a new nozzle.

POLYWATER UPR

Catalog #	Package Description	Units/Case
UPR-PRKIT3	3 - 250-mL UPR cartridges; 4 - mixing nozzles; 5 - green-treated wood blocks; 1 - roll of stretch wrap; 1 - pair of gloves; 1 - instruction sheet	1
UPR-PRKIT12	12 - 250-mL UPR cartridges; 16 - mixing nozzles; 18 - green-treated wood blocks; 1 - roll of stretch wrap; 4 - pairs of gloves; 1 - instruction sheet	1
UPR-NFKIT4	4 - 250-mL UPR No Flow Pole Repair cartridges; 6 - mixing nozzles; 1 - roll of stretch wrap; 1 - pair of gloves; 1 - instruction sheet	1
UPR-NFKIT12	12 - 250-mL UPR No Flow Pole Repair cartridges; 18 - mixing nozzles; 1 - roll of stretch wrap; 3 - pairs of gloves; 1 - instruction sheet	1
UPR-NF6B10	10 - 600-mL UPR No Flow Pole Repair side-by-side cartridges; 10 - mixing nozzles; 1 - roll of stretch wrap; 3 - pairs of gloves; 1 - instruction sheet	1

SPECIFICATIONS AND APPLICATIONS:

- **Strength and Gaffability:** UPR has good compressive strength, comparable to wood. When tested with a gaff, it holds well. The gaff penetrates to an acceptable depth with similar force compared to wood.
- **Compatibility:** Can be used to repair penta-treated wood, western red cedar, Douglas fir, red pine, southern yellow pine, lodgepole pine poles, and other varieties of wood.

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Utility Pole Restoration
UPR™ PR (Standard) and NF (No Flow)

American Polywater® Corporation

TECHNICAL DATA SHEET

Description:

UPR™ PR and NF Pole Repair Sealants repair woodpecker holes in wooden utility poles. They are easy and convenient to use. The two-part formulas are deployed with a standard caulking gun and mix right in the nozzle. There is no direct handling of the products.

UPR™ PR kits include wood blocks to fill cavity space so that less product is required. UPR™ NF quickly gels so that it does not flow through cracks in the wood.

UPR™ PR and NF Pole Repair expand in the hole to fill irregular shaped cavities and integrate with the wood. This creates superior adhesion to the wood. It hardens like wood with compression strength similar to the cross-sectional hardness of a wood pole. They remain gaffable and will not chip out in chunks when a climber's hooks are embedded into its surface structure.

Compressive Strength

UPR™ PR and NF Pole Repair have similar compressive strength to wood, perpendicular to the grain. Common utility pole wood is compared.
(Data U.S. Forest Products Laboratory)

Compressive Strength

UPR™ PR Standard	1500 psi
UPR™ NF No Flow	850 psi
Southern Yellow Pine	910 psi
Douglas Fir	760 psi

UPR™ PR and NF Pole Repair match wood pole strength. The repair area will not create a stress point when the pole flexes during storms and high winds.

Fungal Resistance

UPR™ PR and NF Pole Repair are inert materials: mold and fungus cannot use them as a food source. The reaction temperatures exceed 212° F (100° C), eliminating most molds and fungus. The repairs block moisture. This keeps the areas dry and less likely to support mold and fungus growth.



Woodpecker damage repaired with UPR™ Pole Repair

Product Benefits:

- Expands to fill all voids
- Creates a strong resilient repair
- Blocks water ingress
- Matches wood characteristics, gaffable
- Wide installation temperature range

Installation Benefits:

Both UPR™ PR and NF Pole Repair come in convenient packaging and kitting.

- No special deployment tools needed
  Less expensive, more convenient
- No drilling to deploy the product
  Less labor time
- No mixing or direct handling of the product
  Less mess and safer
- Single kit will repair one hole
  Less waste

Component Properties:

Both UPR™ PR and NF Pole Repair are two-part, urethane structural foams mixed at a 1/1 ratio.

UPR™ PR & NF Pole Repair

Property	Part A (Resin)	Part B (Curing Agent)
Color	Amber	Brown
Form	Liquid 200 -250 cps	Liquid 1050 cps
VOC Content:	0 g/L	0 g/L
Specific Gravity	1.22 -1.23	1.05

Cured Properties:

Both products cure to solid, closed-cell foams.

UPR™ PR & NF Pole Repair

Property	Typical Result
Appearance	Brown with small, even cells
Closed Cell Percent	> 90%
Density (static mixer)	
UPR™ PR Standard	25 lbs/cu ft
UPR™ NF No Flow	26 lbs/cu ft
Compressive Strength (ASTM D1691)	
UPR™ PR Standard	1,500 psi
UPR™ NF No Flow	850 psi

Moisture Testing:

UPR™ Pole Repair does not absorb water, so it will not increase the chance of pole decay. It is good practice to use a dry fungicide prior to deploying any wood pole repair product to reduce or negate any fungal growth that is present.

Moisture Repellency Testing
Six 1-1/2-inch cubes reacted UPR™ were aged in water for 7 days at 122°F (50°C). Weight gain was measured.

	Water Weight Gain
UPR™ PR Standard	< 1%
UPR™ NF No Flow	< 1%

The UPR™ PR and NF Pole Repair act to seal the hole from water and protect the pole from further degradation.

OSHA Requirements:

OSHA 1910.269 App D requires poles to be inspected and tested before climbing. The standard notes that “hollow spots and woodpecker holes can reduce the strength of the wood pole.” Pole repair satisfies OSHA requirements and improves the pole strength. It also reduces the likelihood of decay.

Gaff Testing:

Cut-Out Test

The “Pole Cut Out Test”[1] was used as a guideline to test Polywater’s UPR™ PR and NF Pole Repair repairs. In this test, the climber jabs the gaff into the pole at a 30° angle to a depth of ¼-inch. Pressure is exerted onto the gaff and the point of the gaff penetrates the wood. The pole surface cut is measured, and shall be no more than 2 inches.

[1] *Buckingham Manufacturing Company, Inc. Buckingham Gaff & Climber Information; “How to Perform the Pole Cut Out Test”*

Gaff Surface Cut	Result
½ to 1-½inch	Pass

The Pole Cut-Out Test showed that both UPR™ PR and NF Pole Repair are gaffable.

Penetration Test

UPR™ PR and NF Pole Repair were molded into 7-inch cylinders. A Buckingham gaff was used to penetrate the side of the form. An Instron unit was set to 50 mm/minute to drive the gaff into the form to a depth of 0.475 inches and load force was measured. An average of three tests was calculated:

Substrate	Penetration Force
UPR™ PR Standard	270 lb_f
UPR™ NF No Flow	140 lb_f
Douglas Fir	244 – 290 lb_f
Southern Yellow Pine	232 – 475 lb_f

Both UPR™ PR and NF Pole Repairs fall within the same range as the wood poles[2] and are relatively easy to penetrate.

[2] Shupe, Todd F. and Freeman, Mike H. (October, 2011) *Effect of Preservative Type and Gaff Type on Gaff Penetration Into Wood Poles*. Eastern Utility Pole Conference, Baltimore, MD.

Installation:

Polywater® UPR™ PR and NF Pole Repair are packaged in kit form. Everything needed to repair damage to wood poles caused by woodpeckers is included.

The two-part formulas are dispensed using a 2-part coaxial caulking tube with static mixing nozzle. They do not require hand mixing, which allows for multiple applications, and makes it easier to direct the product into the hole when deployed. The curing temperatures are not dangerously hot as are some other repair products, yet may be warm enough to reduce pole decay.

Once a skin has formed, the foam may be visually inspected through the shrink wrap to determine whether the hole has been completely filled.

To decrease cure time in cold temperatures, warm UPR™ Pole Repair cartridges prior to use. UPR™ NF *must be warmed* to 60°F.

Usage Quantity

UPR™ PR Standard

Hole Depth (in)	Product Required	Hole Diameter 6 inches	Hole Diameter 8 inches
8	Cartridge	3	6
	Blocks	5	7
12	Cartridge	5	9
	Blocks	6	10

UPR™ NF No Flow

Hole Depth (in)	Product Required	Hole Diameter 6 inches	Hole Diameter 8 inches
8	Cartridge	5	9
12	Cartridge	8	13

Safety:

UPR™ PR and NF Pole Repair are two-part urethane foams containing reactive chemicals. Polyurethanes are common in the construction industry and have been used for many years. Some individuals may become sensitized to components in the unreacted resin. Precautions must be observed during use and handling of these materials.

Cure Rate:

UPR™ PR can be used in temperatures down to 20°F (-6°C) as long as the cartridge is above freezing. UPR™ NF can be used in temperatures down to 20° F (-6°C) but *must be warmed* to 60° F (15°C). At low temperatures, the reaction is slow, but will completely foam and cure with time. At cold temperatures, the components become more viscous and flow through the mixing nozzle at a slower rate. This higher viscosity may block the UPR™ NF nozzle if it is not warmed. Cure times are as follows:

UPR™ PR Standard Pole Repair	Reaction Time (Minutes) 40° F (4° C)	70° F (21° C)
Foaming, Expansion Complete	8 - 9	4 – 5
Hard, Non-sticky Skin Formation	15 – 18	7 – 9

UPR™ NF No Flow Pole Repair	Reaction Time (Minutes) 40° F (4° C)	70° F (21° C)
Foaming, Expansion Complete	--	3 – 5
Hard, Non-sticky Skin Formation	--	3 – 5

Environmental Resistance:

UPR™ PR and NF Pole Repairs withstand the rigors of the changing, outdoor environment.

Cured Sealant Temperature Use Range
-40° F to 150° F (-40° C to 65° C)

Clean-up

Any unreacted material may be cleaned from surfaces with a solvent wipe such as Polywater's Type HP™ Cleaner/Degreaser. The Part A, amber resin will react with water if surfaces are washed with a soap and water solution. Once reacted, the foam has strong adhesion, and may be scraped or cut from surface. The reacted product is an inert solid with non-hazardous character.

The use of UPR™ PR and NF Pole Repair in the prepackaged cartridge controls and reduces exposure. Once reacted, the foams are solid, closed-cell polyurethanes. The finished products may be considered non-toxic. See SDS for more information.

Storage and Handling:

Keep containers cool, dry and away from sunlight. Leave cartridges in the protective foil pouch until ready to use/reuse.

Product shelf life is one year. Shelf life is one month after the product is opened.

Model Specification:

The statements below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

Approved utility pole repair sealant is UPR™ Pole Repair Sealant. The repair sealant shall come in a multiple-use cartridge to fill various sized defects in poles. The sealant shall be an expanding foam system to best fill all voids in the defect.

The packaging shall automatically meter and mix the sealant. The sealant kit shall include wood blocks which act as filler reducing the needed amount of sealant. The cure rate of the sealant shall be fast. It shall reach full expansion in less than 5 minutes at 70°F (21°C) and form a hard, non-sticky skin in less than 10 minutes at 70°F (21°C). The reaction temperature of the sealant should reach a minimum of 212°F (100°C) to help kill microbes present in the defect.

Once cured, the sealant shall be waterproof. The sealant shall have compressive strength similar to utility wood as measured perpendicular to the grain. It shall be between 750 and 2,000 psi. The foamed sealant shall have a density of 25 lbs/cu ft. The foamed sealant shall pass the Cut-Out Test to determine gaffability. The sealant shall yield a less than 300 lbf in the Gaff Penetration Test.

Order Information:

Cat #	Package Description
UPR-PRKIT12 (1 unit/case)	12 - 8½-oz two-part foam caulking style cartridges with resealing cap 16 - Static mixing nozzles 1 - Roll shrink wrap 18 - Wood blocks (filler) 1.5” X 1.5” X 4” 4 - Pair gloves 1 - Instructions
UPR-PRKIT3 (1 unit/case)	3 - 8½-oz two-part foam caulking style cartridges with resealing cap 4 - Static mixing nozzles 1 - Roll shrink wrap 5 - Wood blocks (filler) 1.5” X 1.5” X 4” 1 - Pair gloves 1 - Instructions
UPR-NFKIT12 (1 unit/case)	12 - 8½-oz two-part foam caulking style cartridges with resealing cap 18 - Static mixing nozzles 1 - Roll shrink wrap 3 - Pair gloves 1 - Instructions
UPR-NFKIT4 (1 unit/case)	4 - 8½-oz two-part foam caulking style cartridges with resealing cap 6 - Static mixing nozzles 1 - Roll shrink wrap 1 - Pair gloves 1 - Instructions

For installation instructions, video and other product information, please see the **UPR™ Pole Repair Website**
(www.polywater.com/upr.asp)

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Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ Software

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Polywater® AirRepair®

PRESSURIZED LEAK REPAIR SYSTEM



AirRepair applied to a telco cable

Seals Air Leaks in Pressurized Cable and Splices

PRODUCT BENEFITS

- **Eliminates Hot Lead Wiping:** Improved safety and convenience.
- **Multiple Uses:** Seals air leaks in lead-sheathed cables, splice enclosures, polyethylene stalpeth cable jackets, load coils, end-plates, and more.
- **Easy to Apply:** AR paste seals hard-to-reach areas.
- **Fast Cure Time:** Ready for pressurization in 15 minutes.
- **Saves Money:** Less expensive and faster than hot lead wiping.

Revolutionary Leak Repair System

AirRepair® Sealant seals leaks in lead-sheathed cables and splice enclosures. It eliminates messy and dangerous molten lead “hot wipe” procedures. AirRepair sealant allows a single craftperson, with minimal training, to effectively and economically seal 20 or more leaks per day.



AR-KIT with cable and completed patch



AirRepair applied to lead splice

polywater.com | 651-430-2270

American Polywater® Corporation



Single AR-KIT



Customized kits to fit specific needs

Multiple Package Types Cover All Cleaning Needs

AirRepair Sealant is provided in a kit customized to end-user needs. The kit contains the preparation and patching materials necessary to repair air leaks in polyethylene and lead-sheathed cables and splice enclosures. Components typically include sealant, putty, cleaning wipes, abrasive cloth, mixing and application tools, gloves, primer (for polyethylene applications), and detailed instructions.

POLYWATER AIRREPAIR

Catalog #	Package Description	Units/Case
AR-KIT	Customized AirRepair kit. Call for details	Varies
AR-STICK	7-in. (18-cm) putty stick for temporary leak plugging	12
PW-1	Plastic primer towelette	10
RP-1	Type RP™ surface prep wipes	96

SPECIFICATIONS AND APPLICATIONS:

- **Pre-Measured Packaging:** One kit contains enough material to to seal a leak, approximately 6 square inches at ¼-in. thickness.
- **Chemical Resistant:** Sealant is chemically resistant to dielectric fluids, SF_6 gas, UV rays, water, and oil.
- **Impact Resistance:** The repair patch has the flexibility to withstand a steel-ball impact of at least 65 in.-lbs. on lead and 55 in.-lbs. on polyethylene.
- **Excellent Adhesion, No Sag:** Repair patch has excellent adhesion to multiple substrates and will not sag while curing. This allows for application to the bottom side of leaking surfaces without running or dripping.

CONTACT US

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American Polywater® Corporation

11222 60th Street N | Stillwater, MN 55082 USA

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Pressurized Leak Repair

TECHNICAL DATA SHEET

Description:

AirRepair® Paste Sealant is a two-part, rapid-cure, resin system for pressurized telephone cables and splices. AirRepair® seals air leaks in lead-sheathed cables and splice enclosures, polyethylene Stalpeth® cable jackets, load coils, end-plates, and more. AirRepair® eliminates messy and dangerous molten lead "hot wipe" procedures. The cured resin maintains a high level of adhesion and structural integrity to insure a quality leak repair.

AirRepair® Sealant is sold as a field repair system and includes materials to seal active leaks. It is a fast cure sealant designed for quick and easy use. AirRepair® allows a single craftsperson, with minimal training, to effectively and economically seal 20 or more leaks per day. Sealant bonds to polyethylene, lead, aluminum, ceramic and steel.



Performance:

AirRepair® Paste Sealant is designed specifically for the field repair of air-pressurized cable systems.

To test the performance, specialized test methods were developed. A 1/16-inch hole is punched into the center of a lead disk and placed into a small, specially designed pressure chamber set to 10 psi. Repaired disks are kept under pressure for 24 hours to pass the test.

Aging Condition on Lead	Result
Initial Application	Pass
6 Months Ambient Aging	Pass
6 Months Immersion, Tap Water	Pass
6 Months Immersion, Salt Water	Pass

In similar testing, an air-core, polyethylene cable and a galvanized steel pipe are punctured with a 1/16-inch hole, sealed and pressurized.

Aging Condition	Result
Polyethylene Cable, 80 psi	Pass
Galvanized Pipe, 200 psi	Pass

Product Benefits:

- Quick plugging action
- Easy to install, fast repair time
- Permanent, long-lasting seal
- Durable, withstands environmental extremes
- Impervious to water and other manhole contaminants
- Seals and protects oil-filled system
- Convenient, field-ready kit

Typical Applications:

- Lead Splice
- Load Coil
- Manifold
- Waffle Case
- End Plate
- Polyethylene “Air-Core” Cables

Component Properties:

AirRepair® Sealant is a 2-part, thick paste sold ready to mix and use.

Property	Part A (Resin)	Part B (Curing Agent)
Color	Black	White
Form	Thick Paste	Thick Paste
VOC Content:	0 g/L	0 g/L
Specific Gravity	1.7	1.4

Cured Properties:

AirRepair® Sealant cures to form a solid patch. Pre-measured packaging contains enough material to seal one typical leak, approximately 6 square inches at ¼-inch thickness.

Property	Typical Result
Color	Dark Grey
Peak Exotherm @ 70º F	< 200°F
Hardness 7 Days @ 70º F (Shore D Durometer)	75
Flexural Strength (ASTM D790)	6,925 lb_f/in^2 1.43 X 10^{-2} in/in

Typical Impact Resistance:

Substrate	Result
Air-core polyethylene cable	55 in-lbs
Air-core lead cable	65 in-lbs

Tested using ASTM G14. Samples are sanded, cleaned and allowed to cure for 24 hours.

Typical Shear Strength:

Substrate	Result
Aluminum	> 1,000 lbs/in^2
Polyethylene	114 lbs/in^2
PVC	148 lbs/in^2

Tested using ASTM D1002. Samples are sanded, cleaned and allowed to cure for 24 hours.

Typical Peel Strength:

Substrate	Result
HDPE (90°)	49 pli
Glass-filled PPO Resin	34 pli
PVC (90°)	46 pli
Ceramic (90°)	>100 pli
Galvanized Steel (180°)	>100 pli
Aluminum (180°)	>100 pli
Lead (180°)	16.5 pli
Copper (180°)	>100pli
Stainless Steel (180°)	>100 pli

Tested using ASTM C794. Samples are sanded, cleaned and allowed to cure for 24 hours.

Chemical Resistance

AirRepair® Sealant is chemically resistant to dielectric fluids, SF_6 gas, uv, water and oil.

ASTM D1002 is used to test the shear strength of the PowerPatch® Sealant on steel after exposure to solvent. The sample is allowed to cure 7 days, immersed in solvent and aged at 50°C.

Fluid*	Appearance (6 months)	Comparison to Control
Mineral Oil	No Change	100% (Pass)
Polybutene Fluid	No Change	100% (Pass)
Hydrocarbon Fluid	No Change	100% (Pass)
Silicone Oil	No Change	100% (Pass)

**Mineral Oil (Holland 70), Polybutene (Duddek PLIC), Hydrocarbon Fluid (Bio Temp), Silicone Oil (GE Silicone SF 96-100)*

Application:

AirRepair® Sealant is easy to use. For full installation information, please see AirRepair® Use Instructions. *(www.polywater.com/ARinstructions.pdf)*

For applications on polyethylene, Stalpeth® cable, AirRepair® Plastic Primer is available.

In cold weather, materials should be kept as warm as possible. Store materials in a warm vehicle and use chemical warming pad to increase the temperature of the repair area.

Cure Rate:

Application temperature is 40°F to 120°F. Cure rate depends on temperature.

Temperature	Working Time	Functional Cure
35° F	40 Minutes	7 Hours
52° F	20 Minutes	3 ½ Hours
60° F	10 Minutes	1 ½ Hours
70° F	6 Minutes	60 Minutes
88° F	4 Minutes	40 Minutes

Installation:
A pressure test was used to determine seal time under ambient conditions. Lead disk was prepared, and placed into specially designed pressure chamber.

Aging Condition	Seal Time	Result
Seal time at 70°F	6 Minutes,	Holds 10 psi air pressure

At ambient temperatures, seal is completed in less than 10 minutes.

Vertical Sag:

AirRepair® Paste clings to vertical surfaces and other difficult angles common in field repairs. Once applied, it stays in place.

In this test, the AirRepair® Paste is mixed and applied to a metal platen at a 90° angle. Displacement is measured and recorded.

Temperature	Displacement from Center
60°F	0 inches
75°F	1/16 inch
95°F	3/32 inch
110°F	3/16 inch

AirRepair® Paste shows minimal sag within a large temperature range.

Environmental Resistance:

Temperature Range:

Application:	40°F to 120°F
Usage:	-40°F to 400°F

Temperature Cycle Testing
(-22 ºF/203 ºF 10 Cycles)
No significant change in adhesion:

Material	Adhesion Compared to Non-Aged Control
Galvanized Steel	100 % (Pass)
Aluminum	100 % (Pass)
Ceramic	100 % (Pass)
Copper	100 % (Pass)
Stainless Steel	100 % (Pass)
Lead	100 % (Pass)

AirRepair® Sealant is resistant to ultraviolet exposure and withstands direct sunlight with no decrease in functionality.

Safety:

AirRepair® Sealant has a low level of toxicity. Good industrial hygiene practice and appropriate precautions should be employed during use. Avoid inhalation of vapors and personal contact with the product. Provide appropriate ventilation/respiratory protection against decomposition products during welding/flame operations (i.e. torches used to install heat shrink products) on or near cured product. See SDS for specific details.

Storage and Handling:

Keep containers cool, dry and away from sunlight. Keep containers tightly closed.

Product shelf life is 15 months.

Model Specification:

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

Approved air pressure repair compound is AirRepair® Sealant. The air pressure repair compound shall be available in a system that allows rapid, permanent repairs without any special equipment. It shall be possible to make the repairs under low air pressure. The product shall not sag during cure so that it may be applied to the bottom side of leaking surfaces without running or dripping. Once cured, the adhesive patch shall have the following properties.

The adhesive repair patch shall have excellent adhesion to a variety of substrates with minimum peel strength of 15 pli on lead, 40 pli on polyethylene, 100 pli on steel, and 100 pli on ceramic when measured by ASTM C 794. The adhesive repair patch will retain 100% of the adhesion as measured by peel strength after 5 freeze/thaw cycles. The adhesive repair patch shall withstand temperatures from -50°F to 250°F. It shall be impervious to water, salt water, oils, and dilute acids and bases.

The repair patch shall have the flexibility to withstand a steel ball impact of at least 65 in-lbs on lead and 55 in-lbs on polyethylene as measured by ASTM G14. It shall have a minimum flexural strain of 1.1 in/in as measured by ASTM D790. The adhesive patch shall not contain any metals. It shall be non-conductive and shall not corrode.

Order Information:

Cat #	Package Description
AR-KIT97	1 Set Two-Part AirRepair® Sealant (parts A and B) 1-3/4" Putty Stick 2 Type RP Cleaning and Preparation Wipes 12" Strip Sanding Cloth 2 Mixing Sticks 1 Pair disposable gloves 1 Instruction sheet
AR-KIT97P ***(Special Order)***	AR-KIT97 Components 1 Plastic Primer Wipe (PW-1) 1 Cotton Swab Primer Applicator
AR-KIT99	1 Set Two-Part AirRepair® Sealant (parts A and B) 1-3/4" Putty Stick 3 Type RP Cleaning and Preparation Wipes 12" Strip Sanding Cloth 2 Mixing Sticks 1 Plastic Primer Wipe (PW-1) 1 Cotton Swab Primer Applicator 1 Trowel Tool 1 Pair disposable gloves 1 Instruction sheet

***Custom kits available. Call factory for details*

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Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ Software

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Polywater® PedFloor™

PEDESTAL SEALING FOAM BARRIER



Polywater PedFloor burst pack installation

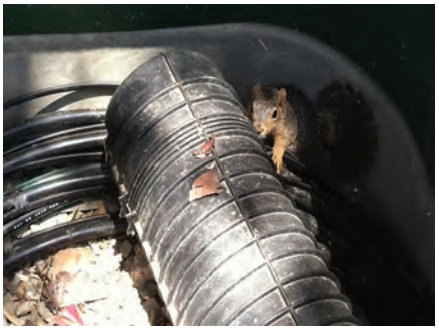
Creates a Hard Foam Barrier to Prevent Pest Infestation

PRODUCT BENEFITS

- **Deterrent:** Keeps rodents, snakes, and insects from entering the pedestal or cabinet.
- **Strong:** Structural foam matrix creates a strong seal.
- **Complete Seal:** Flows and self-levels before expansion to prevent ground entry.
- **Versatile:** Can be used as a suspended floor or directly on the ground.
- **Protects:** Cured product offers permanent protection through weather extremes.

Structural Barrier to Prevent Service Disruptions

Polywater® PedFloor™ Pedestal Sealant helps prevent outages and service disruptions by curing into a resilient and impermeable structural barrier. PedFloor keeps out moisture and stops pests from burrowing into the enclosure and causing costly outages or health and safety hazards.



Rodent inhabitation



Unsanitary rodent nest

polywater.com | 651-430-2270

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PedFloor burst packs



PF-3 kit components

Convenient Kits for Easy Installation

Polywater PedFloor kits include resins, plastic containment sheet, tape, gloves, and instructions. The PF-1, PF-2, and FSTBP-200B6 are "burst packs" *(photo 1);* parts A & B are mixed in the flexible packaging after breaking the pack's center seal. PF-3 *(photo 2)* contains premeasured containers of the two-part foam.

POLYWATER PEDFLOOR

Catalog #	Package Description	Units/Case
PF-1	1 - PedFloor burst pack (750 mL); 1 - pair of gloves; 1 - plastic sheet (per case); 1 - roll duct tape; 1 - instruction sheet Covers 1 square foot, 3 inches thick	2
PF-2	1 - PedFloor burst pack (1500 mL); 1 - pair of gloves; 1 - roll duct tape; 1 - plastic sheet; 1 - instruction sheet Covers 2 square feet, 3 inches thick	2
PF-3	1 - bottle part A; 1 - bottle part B; 1 - pair of gloves; 1 - mixing pail; 1 - mixing stick; 1 - plastic sheet; 1 - roll duct tape; 1 - instruction sheet Covers 3 square feet, 3 inches thick	1
For small repairs and/or supplemental patching, use an FSTBP™ Burst Pack:		
FSTBP-200B6	6 - FSTBP-200 (200 mL) burst packs; 6 - pairs of gloves; 1 - instruction sheet	1

SPECIFICATIONS AND APPLICATIONS:

- **Working Temperature:** PedFloor is most effective when used between 35°F (2°C) and 110°F (43°C).
- **No Application Tool:** The convenience of a burst pack ensures no application tools or accessories are necessary in the field.
- **Reaction/Curing Time:** Sealant will flow and expand for approximately 20 minutes.
- **Multiple Applications:** Bonds well to itself, ensuring multiple applications of PedFloor have the same strength as a single deployment.

CONTACT US

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Communications Cleaners

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Who says you can't clean fiber with water?
• Water-based
• Less toxic
• Eco-friendly
AquaKleen™
polywater.com/aquakleen.asp

Who says you can't clean fiber with water? Defying conventional wisdom, AquaKleen™ Water-based Fiber Optic Endface Cleaner is a brand new solution to the problem of cleaning fiber.

A special blend of 94% pure deionized water, with cleaning solvents, AquaKleen™ Cleaner is friendly to the environment, less toxic, and safer for use by humans.

Products available individually, or as a kit:

CATALOG #	DESCRIPTION	CASE QUANTITY
AQ-2LP	2-Oz AquaKleen™ Type AQ Finger Sprayer	12
AQ-WETDRY1	AquaKleen™ Wet/Dry Wipe Tandem Pack	144
AQ-2DR	2-OZ AquaKleen™ Squeeze Bottle	12
AQ-KIT2	AQ-KIT2 AquaKleen™ Type AQ Kit Kit contains: 2 X AQ-2LP 1 X DT-D175 1 X SWB-250F100	1
AQ-KIT3	AQ-KIT3 AquaKleen™ Type AQ Kit Kit contains: 2 X AQ-2DR 1 X DT-D175 1 X SWB-250100	1



FiberKleen™ towelette dispenser contains 175 lint-free, high quality microfiber towels that are used to clean ferrules, bulkheads and fiber endfaces. The engineered design of the nonwoven, highly absorbent towel traps the dirt and debris removed from ferrules, making cleaning easier and more effective. Variety of swabs also available.

Meets Telcordia specification GR-2923-CORE, "Generic Requirements for Fiber Optic Connector Cleaning Products."

All products non-hazardous for air shipment.

CASE CATALOG #	DESCRIPTION	CASE QUANTITY
DT-D175	175-Count Microfiber FiberKleen™ Dry Towel Plastic Dispenser Pack	12
SWB-250F100	2.5 mm FiberKleen™ Foam Swab 100-Pack	5
SWB-125F10	1.25 mm FiberKleen™ Foam Swab 10-Pack	5
SWB-C100	FiberKleen™ Cotton Swab 100-Pack	5
SWB-V100	V Groove FiberKleen™ Foam Swab 100-Pack	5
SWB-M100	Mirror FiberKleen™ Foam Swab 100-Pack	5

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polywater.com/aquakleen.asp

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AquaKleen™
Water-based Fiber Cleaner

American Polywater® Corporation

TECHNICAL DATA SHEET

Description:

AquaKleen™ Fiber Cleaner is formulated for cleaning fiber-optic cables and endfaces. Its excellent wetting reaches precision parts to lift dust, buffer gel, lint, finger prints, and oils. AquaKleen™ dissipates static to remove surface charges so that the surface is less likely to be re-contaminated.

AquaKleen™ Fiber Cleaner contains innovative, water-based technology. A special blend of 94% ultra-pure deionized water with proprietary solvents; it does not leave a residue. AquaKleen™ is an environmentally desirable cleaner. It does not contribute to global warming or ozone depletion and has very low VOC content. AquaKleen™ is non-flammable and has low toxicity for safe use.

AquaKleen™ Fiber Cleaner is packaged in easy-to-use containers that allow precise cleaner application, reduce waste, and limit contamination. Polywater's non-woven FiberKleen™ towelettes trap dirt and absorb contaminants from high-speed fiber and optical equipment. A smooth wiping surface and durable material promote easy, effective cleaning.

Performance Properties:

AquaKleen™ Fiber Cleaner is a high-performance optical cleaner. AquaKleen™ removes a broad variety of endface contaminants.

Soil Type	Cleaning Effectiveness
Dry/Ionic Soil (dust, salt)	Excellent
Wet/Non-Ionic Soil (oil, buffer gel)	Excellent
Combination Soil	Excellent

AquaKleen™ Fiber Cleaner has been tested to the rigorous standards of Telcordia GR 2923-CORE, "Generic Requirements for Fiber Optic Connector Cleaning Products."



Product Benefits:

- Eco Friendly, Non-Toxic
- Water-based
- Dissipates Static
- No Residue
- Excellent Solvency
- Non-Flammable
- Easy to Transport

End Use:

AquaKleen™ Fiber Cleaner is an excellent choice for cleaning precision fiber-optic components such as:

- Endfaces
- Single-mode Fiber
- Multi-mode Fiber
- Ferrules
- Bulkheads
- Lenses, Mirrors

Approvals:

- Meets Telcordia GR 2923-CORE, "Generic Requirements for Fiber Optic Connector Cleaning Products."
- RoHS and WEEE compliant.

Physical Properties:

AquaKleen™ Fiber Cleaner is a high purity, optical grade cleaner.

Property	Result
Residue	< 100 ppm
Flashpoint (ASTM D93)	>140°F (60°C)
Initial Boiling Point	212°F (100°C)
Specific Gravity	1.0
Evaporation Rate	Medium

Environmental Impact:

AquaKleen™ Fiber Cleaner is an excellent alternative to solvent-based cleaners.

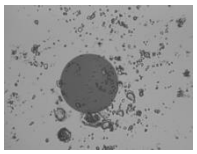
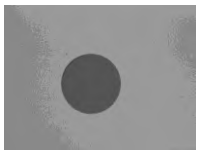
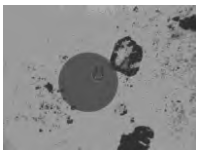
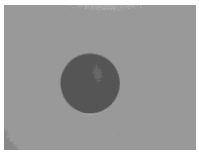
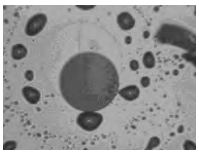
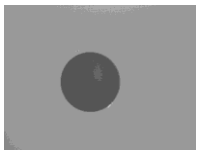
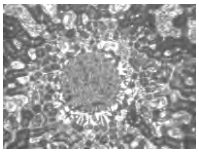
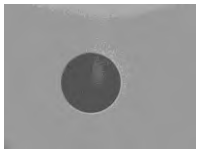
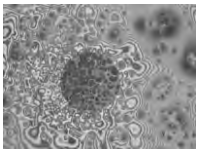
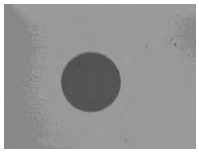
Property	Result
VOC Content	60 grams/liter
Global Warming Potential	Does not contain global warming compounds
Ozone Depletion Potential	None
CFC, HCFC, HFC Content:	None
RCRA	Not regulated as hazardous waste
CERCLA/SARA Status	Not regulated as a hazardous substance
RoHS and WEEE	Compliant
REACH	Compliant

Safety:

AquaKleen™ Fiber Cleaner has a low level of toxicity and does not contain any listed carcinogens. Good industrial hygiene practice and appropriate precautions should be employed during use. See MSDS for specific details.

Cleaning Properties:

AquaKleen™ Fiber Cleaner removes a broad range of contaminants from fiber connectors. To prove this, reference reflectance and transmitted power is measured on an unsoiled test connector at 1310 nm, 1550 nm and 1625 nm. Then the near-end connector plug is removed and soiled according to standard[1]. Connector end adapter is cleaned using recommended procedure. Insertion loss and reflectance are measured and compared to control. An electronic image of each cleaning is recorded.

Soil	Image – Soiled	Image – 1st Cleaning
Gypsum		
Carbon Black		
Olive Oil		
Gypsum/ Buffer Gel		
Gypsum/ 10W30 Oil		

Soil	Insertion Loss	Reflectance
Gypsum	Pass (<0.05 dB loss)	Pass (<2 dB change)
Carbon Black	Pass (<0.05 dB loss)	Pass (<2 dB change)
Olive Oil	Pass (<0.05 dB loss)	Pass (<2 dB change)
Gypsum/Buffer Gel	Pass (<0.05 dB loss)	Pass (<2 dB change)
Gypsum/10W30 Oil	Pass (<0.05 dB loss)	Pass (<2 dB change)

[1] *Tested using methods from Telcordia GR-2923-CORE, "Generic Requirements for Fiber Optic Connector Cleaning Products."*

Compatibility:

AquaKleen™ Fiber Cleaner is compatible with most common plastics and rubbers.

Polycarbonate:
Injection-molded plaques of polycarbonate are cut into bars, 2½ inch by ½ inch. Samples are bent in a three-point fixture. Percent strain is calculated based on the bar thickness and the radius of curvature.

"Strain limit" is the greatest percent strain where no stress cracking occurs. A strain limit greater than 0.5% indicates strain resistance.

Strain Limit > 0.7%

AquaKleen™ Fiber Cleaner shows good compatibility with polycarbonate.

Cladding:
Fiber cladding (Corning Cable) is firmly wiped 5 times with a cleaner-saturated towel. Towel and cable are visually inspected for cladding transfer or damage.

Cladding shows no visible damage.

AquaKleen™ Fiber Cleaner shows good compatibility with fiber cladding.

Soak Testing:
Materials are immersed in AquaKleen™ Fiber Cleaner for 72 hours at 50°C (122°F). Rubbers may swell slightly, but will return to their original state once the cleaner evaporates.

Plastic	Compatibility
Acrylic	Excellent
ABS	Excellent
Nylon 66	Excellent
Polycarbonate	Excellent
Polyethylene (HDPE)	Excellent
Polyethylene (LDPE)	Excellent
PVC	Excellent

Rubber	Compatibility
Silicone Rubber	Excellent
EPDM	Excellent

Usage Directions:

AquaKleen™ Fiber Cleaner is best used with the combination wet - dry cleaning procedure recommended in Telcordia GR-2923-CORE. Microfiber towels (DT-D175) and holder (FC-HOLDER), available from American Polywater Corporation work well with this method.

Several drops or a light spray of cleaner is placed on the towel. Preferred cleaning motion is a straight line motion, drawing the endface through the wetted portion of the towel, and then through a clean portion of a second dry towel. Use of the FC-HOLDER optimizes the cleaning process. Swabs may be dampened on the wetted portion of the towel in order to clean the bulkhead or equipment.

Application Properties:

Temperature Use Range:
20°F to 120°F (-5°C to 50°C)

Storage and Shelf Life:
Keep containers tightly closed when not in use. Shelf life is 2 years.

Packaging:

AquaKleen™ Fiber Cleaner is packaged in safety sealed containers that resist spills, leaks and contamination. The 2-fluid-ounce spray and dropper bottles have over 500 uses.

Microfiber Towels:
FiberKleen™ Dry Towels offer high absorbency and are made from non-linting, non-fraying, ultra-clean material. This specialty, microfiber fabric is engineered for optimum particle entrapment. The durable towel has a smooth surface for easy cleaning. It meets Telcordia Specification.



Convenient Kit Packaging and Cleaning Accessories

Model Specification:

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

The fiber cleaner shall be effective on both ionic and non-ionic soils. It shall meet the cleaning criteria of Telcordia GR 2923-CORE, "Generic Requirements for Fiber Optic Connector Cleaning Products." It shall contain an oxygenated solvent component for static dissipation.

The cleaner shall leave minimal residue of less than 100 ppm. It shall be compatible with fiber optic components. It shall not stress crack polycarbonate and shall have a strain limit greater than 0.5%.

The cleaner shall be water-based with low toxicity and low environmental impact. It shall have a volatile organic content (VOC) less than 100 grams/liter. It shall not contain any global warming compounds and have no ozone depletion potential.

Order Information:

Cat #	Package Description
AQ-2LP	2-oz AquaKleen™ Fiber Cleaner Finger Sprayer
AQ-2DR	2-oz AquaKleen™ Fiber Cleaner Squeeze Bottle Dropper
AQ-KIT2	AquaKleen™ Fiber Cleaner Kit: 2 AQ-2LP 1 DT-D175 1 SWB-250F100
AQ-KIT3	AquaKleen™ Fiber Cleaner Kit: 2 AQ-2DR 1 DT-D175 1 SWB-250F100
DT-D175	175 microfiber towels in a sealed plastic dispenser pack with cleaning pad
SWB-250F100	2.5 mm FiberKleen™ foam swab (100 pack)
SWB-125F10	1.25 mm FiberKleen™ foam swab (10 pack)
SWB-C100	FiberKleen™ cotton swab (100 pack)
SWB-V100	V Groove FiberKleen™ foam swab (100 pack)
SWB-M100	Mirror FiberKleen™ foam swab (100 pack)

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Lit-AQTECHSPEC/REV002

Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ Software

American Polywater® Corporation

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Polywater® HydraSol®

CABLE GEL REMOVER



Prepping copper cable for cleaning icky-pic

Water-Based Cleaner for Removing Cable Filling Greases

PRODUCT BENEFITS

- **Fast and Effective:** Maximum solvency power on PE/PJ or ETPR greases.
- **Clean:** Rinses completely with water.
- **Less Waste:** Good for multiple cleanings.
- **Safe:** No chlorinated solvent, CFC, or glycol ether content.
- **Tailored for the Job:** Available in a variety of convenient packages.

A Unique Approach in Cable Cleaning Materials

HydraSol® is a water-based, non-flammable cleaner that effectively cleans copper and fiber gel-filled cables. This cleaner excels at dissolving and removing cable filling greases (icky-pic) and is safer to use than other solvent-based cleaners.



HS-32 applied to towelette for cleaning



HS-1 towelette wiping gel from fiber

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American Polywater® Corporation



HydraSol family



HS-D72 towelette dispenser

Multiple Package Types Cover All Cleaning Needs

The HydraSol family (*photo 1*) is available in multiple packages to address the need of the user. The HS-1 is a durable, non-linting saturated towelette for convenient field use. Saturated towelettes are also available in a 72-count dispenser (*photo 2*). The HS-32 is an easy-to-handle quart bottle that is available with a flip-top cap or a trigger sprayer (HS-32LR).

POLYWATER HYDRASOL

Catalog #	Package Description	Units/Case
HS-1	Premoistened lint-free towelette in foil pack	144
HS-D72	Dispenser with 72 - 10” x 12” premoistened towelettes	6
HS-16LR	1-pt. (475-ml) spray bottle	12
HS-32LR	1-qt. (0.95-liter) spray bottle	12
HS-32	1-qt. (0.95-liter) bottle with flip top	12
HS-96	3 quarts (2.8 liters) in a 1-gal. pail	4
HS-128	1-gal. (3.8-liter) jug	4
HS-384	3 gallons (11.4 liters) in a 5-gal. pail	1
HS-640	5-gal. (18.9-liter) pail	1
HS-DRUM	55-gal. (209-liter) drum	1

SPECIFICATIONS AND APPLICATIONS:

- **Water-Based Cleaner:** Over 50% water-based solvent cleaner for unique safety and handling.
- **Low Toxicity:** Components have low toxicity whether by inhalation or dermal exposure, making it safe for use in vaults and confined spaces.
- **Effectiveness:** Using the Solvency Power Test Method, HydraSol outperformed isopropanol and other competitors’ products in cleaning effectivness and efficiency on multiple types of gels and flooding compounds.
- **Easy to Use:** Rinses easily off hands and tools. Dissolved grease is not redeposited as the cleaner residue dries.
- **Flash Point:** 155°F (68°C), Closed Cup (PMCC).

CONTACT US

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1-651-430-3634 Fax

email: support@polywater.com

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Polywater® SqueekyKleen™

FIBER AND COPPER GEL-FILLED CABLE CLEANER



TC-35LR cleaning 200-pair copper cable

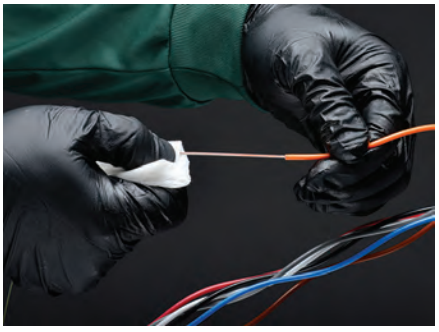
Cable Filling Gel Cleaner for Loose-Tube and Ribbon Fiber

PRODUCT BENEFITS

- **Effective Cleaner:** Quickly cleans cable filling gel and flooding compounds.
- **Cleans IBP Flooding Compound:** Good for cleaning coax cable.
- **Fast Gel Cleaner:** Requires only two wipes and the fiber squeaks and fans.
- **No Residue:** Nothing left to require a secondary alcohol wipe.
- **Industry Tested:** Approved by users and manufacturers.

Safe, Efficient Cleaner That Leaves No Residue

SqueekyKleen™ cleans and fans fiber in two wipes, saving time and money. No follow up with alcohol is required to clean and separate fibers before splicing. It reduces chemical odors and keeps vapor concentrations to a minimum in splice trailers and vaults to ensure a safe environment.



TC-1 wiping gel from fiber



TC-1 cleaning coax cable

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American Polywater® Corporation



TC-D300 towelette dispenser


SqueekyKleen family

Effective Towelette Leaves Fiber "Squeaky Clean"

The SqueekyKleen TC-1 is a durable, non-linting saturated towelette. This wipe is the ideal package for field use because it limits vapor concentration and has no risk of spilling. Saturated wipes are also available in a 300-count dispenser (*photo 1*).

POLYWATER SQUEEKYKLEEN

Catalog #	Package Description	Units/Case
TC-1	Individual 8" x 12" saturated wipe	144
TC-1D42	Dispenser pack with 42 - TC-1	1
TC-D300	Dispenser with 300 - 5" x 6" premoistened wipes	6
TC-16LF	1-pt. (475-mL) bottle with flip top	12
TC-35LF	1-qt. (0.95-liter) bottle with flip top	12
TC-35LR	1-qt. (0.95-liter) bottle with sprayer	12
TC-96	3 quarts (2.8 liters) in a 1-gal. pail	4
TC-128	1-gal. (3.8-liter) jug	4
TC-640	5-gal. (18.9-liter) pail	1
TC-DRUM	55-gal. (209-liter) drum	1

SPECIFICATIONS AND APPLICATIONS:

- **Cleaning:** When wiping a 3-foot section of 12-count fiber from a buffer tube, a saturated towelette will squeak and fan fibers with 2 wipes.
- **Solvency Power:** At 68°F (20°C) it will dissolve a 0.02" (0.5-mm) film of PE/PJ or ETPR grease completely from cable jacket with less than two minutes of vigorous agitation (no wiping).
- **Residue:** When placed on a clean glass panel and dried, the solvent shall leave less than 100 parts per million of residue (<100 ppm).
- **Water Content:** When tested by the ASTM 1533B method, water content shall be less than 75 parts per million (<75 ppm).
- **Flash Point:** When tested via a Pensky-Martin Closed Cup Test (ASTM D93), the cleaner shall have a flash point above 140°F (60°C).

CONTACT US

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SqueekyKleen™
Cable Gel Remover

American Polywater® Corporation

TECHNICAL DATA SHEET

Description:

SqueekyKleen™ Cable Gel Remover effectively cleans filling gels and flooding compounds from fiber optic cables. Designed to quickly solubilize a wide range of gel types, SqueekyKleen™ results in quick and time-saving gel removal from buffer tubes, ribbon cable, and individual fibers. It easily removes flooding compounds from coaxial cables.

In just a few wipes, SqueekyKleen™ completely removes gels and leaves fibers fanned, ready for connection. It does not leave a residue. SqueekyKleen™ is compatible with most materials and plastics including polycarbonate, acrylate coating and ribbon fiber.

SqueekyKleen™ Cable Gel Remover is safe and easy to use. It lasts longer than fast evaporating alcohol and is ideal for gel removal. SqueekyKleen™ emits no dangerous vapors. With a high flash point, it is safe to transport. SqueekyKleen™ is the gel remover of choice for network and cable installers worldwide.

Cleaning Properties:

SqueekyKleen™ Cable Gel Remover dissolves a broad range of gels, filling and flooding compounds.

Property	Result
Gel Removal	Excellent (100% in less than 2 minutes)
Fiber Fan-Out	Excellent (<2 wipes to “squeak”)

Removal: A measured amount of PE/PJ or ETPR gel is spread onto a stainless steel spatula with a coating thickness of 0.5 mm. The spatula is stirred in the gel remover. The amount of gel removed is quantified by observation.

Fan-Out: A towel saturated in SqueekyKleen™ is wrapped around 12 to 18 fibers from a buffer tube. Using the thumb and forefinger to grasp the towel with firm pressure, the cable bundle is flattened and wiped clean. The fibers will fan apart when clean.



Product Benefits:

- No Alcohol Required
- Minimal Wiping
- No Residue
- Safe to Use on Ribbon Cable
- Fans Fibers Quickly
- Compatible with Most Plastics and Rubbers
- Multiple Package Options

End Use:

Removes Gels and Flooding Compounds from:

- Buffer Tubes
- Ribbon Cables
- Individual Fibers
- Coaxial Cables
- Connectors
- Splicing Tools

Physical Properties:

SqueekyKleen™ Gel Remover is a high purity solvent with low aromatic content. It does not leave a residue.

Property	Result
Flash point (ASTM D93)	>140°F (>60°C)
Initial Boiling Point	365°F (185°C)
Specific Gravity	0.79
Percent Aromatics	< 1%
Water Content (ASTM D1533B)	< 75 ppm
Evaporation Rate	Medium
Residue (ASTM D2369)	<100 ppm

Use Directions:

SqueekyKleen™ Cable Gel Remover is suitable for many types of gels and filling compounds. It cleans asphaltic or polybutene flooding compounds from coaxial cables. Use SqueekyKleen™ Remover to clean tools and work areas.

To clean and fan fibers, use the pre-moistened, SqueekyKleen™ Wipe. Do not open the towel. Start at the buffer tube and place stripped fibers into the fold of the towel. Use thumb and forefinger to flatten fibers. Press firmly on the fiber, pulling along the surface to wipe off the gel. Repeat action with a clean fold until fiber "squeaks" clean and fans. SqueekyKleen™ does not require further rinsing or cleaning with alcohol.

Safety:

SqueekyKleen™ Cable Gel Remover has a low level of toxicity and does not contain any listed carcinogens. It is combustible and should not be exposed to fire or flame. Good industrial hygiene practice and appropriate precautions should be employed during use. See MSDS for specific details.

Wipe Package Convenience

SqueekyKleen™ Cable Gel Remover pre-saturated wipes are a convenient package with multiple safety benefits.

Control
Pre-saturated wipes minimize solvent exposure on sensitive fiber optic components. Directly spraying or immersing the part allows the solvent to puddle into small openings. Wipe cleaning will also ensure that the solvent evaporates more quickly.

Safety
The pre-saturated wipe package eliminates spill hazard and limits solvent vapor exposure. Wipes contain a carefully measured quantity of solvent and are an excellent way to control vapor. SqueekyKleen™ Cable Gel Remover does not require a follow-up wipe with alcohol, further reducing vapor exposure. The wipe package is a great choice for underground or confined space applications.

Convenience
Each wipe package utilizes non-linting, non-tearing towels. Clean wipes are always available, eliminating recontamination of fibers with dirty rags or lint.



Convenient wipe package controls solvent exposure and vapor emissions

Environmental Impact:

SqueekyKleen™ Cable Gel Remover Cleaner is a safer alternative to chlorinated solvents.

Property	Result
VOC Content	790 grams/liter
Global Warming Potential	Does not contain global warming compounds
Ozone Depletion Potential	None
CFC, HCFC, HFC Content:	None
CERCLA/SARA Status	Not regulated as a hazardous substance

Compatibility:

SqueekyKleen™ Gel Remover is compatible with most components used in the communications industry. It meets standard test requirements for the various materials in which it may come in contact.

Polyethylene
SqueekyKleen™ Gel Remover is compatible with polyethylene and does not cause environmental stress cracking. [1]

Polycarbonate
SqueekyKleen™ Gel Remover is safe on polycarbonate. Polycarbonate shows chemical resistance to SqueekyKleen with a resistant strain limit of >0.9%.[2]

Corrosivity:
SqueekyKleen™ Gel Remover will not corrode or stain metal parts. It does not tarnish or corrode copper. [3]

[1] Testing based on ASTM D1693, "Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics." Polyethylene shows less than 20% stress cracking after 50°C for 14 days.

[2] Testing based on Mobay Corporation, Plastics and Rubber Division, "Chemical Compatibility Test for Unreinforced Thermoplastic Resins, 1989."

[3] Testing based on ASTM D130, "Standard Test Method for Detection of Copper Corrosion from Petroleum Products by the Copper Strip Tarnish Test."

Soak Testing:

Materials are immersed in SqueekyKleen™ Cable Gel Remover for 72 hours at 50°C (122°F). Some rubbers will swell, but should return to their original state once the cleaner evaporates. Wipe cleaning minimizes solvent exposure.

Plastics	% Weight Change	Appearance
ABS	+0.04	NC
Acrylic	-0.01	NC
Delrin®	+0.03	NC
Epoxy	0.00	NC
Nylon 66	-0.02	NC
Nylon 101	+0.07	NC
Polycarbonate	+0.04	NC
Phenolic	-0.05	NC
PPO	+0.02	NC
PVC	+0.01	NC
Teflon®	+0.03	NC
Tygon®	-0.25	NC
Ultem® 1000	-0.01	NC
Valox® 420	0.00	NC

Elastomers	% Weight Change	Appearance
Neoprene®	+9.31	SS
Nitrile	-2.01	NC
SBR	+47.34	S
Viton®	+0.07	NC

KEY:

NC = No Change
S = Swelling
ES = Extreme Softening
C = Crazing
SS = Slight Swelling
D = Disssolved

Testing based on ASTM D543, "Standard Test Method for Resistance of Plastics to Chemical Reagents."

Delrin®, Teflon®, Neoprene® and Viton® are trademarks of Du Pont. Ultem® 1000 and Valox® 420 are trademarks of G.E. Plastics. Tygon® is a trademark of Norton Performance Plastics

Model Specification:

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

The Gel Remover solvent shall be at least 80% high purity, de-aromatized, aliphatic hydrocarbon enhanced with a cyclic terpene. Aromatic content shall be less than 1%. There should be no surfactants used in the Gel Remover and the residue shall be less than 100 ppm.

The Gel Remover shall dissolve a .020" (.5mm) film of PE/PJ or ETPR grease with less than two minutes of agitation. When wiping a 2-foot section of 24 count fiber from a buffer tube, a towel pre-saturated with the Gel Remover shall "squeak" the fibers with 3 wipes or less. The Gel Remover shall be compatible with materials typical to the communications industry.

The Gel Remover shall be safe to use. It shall have a flash point greater than 140°F (60°C). The Gel Remover shall not be a carcinogen or listed by CERCLA as a hazardous waste.

Order Information:

Cat #	Package Description
TC-1	Single, saturated wipe 144/case
TC-1D42	42 TC-1 in a dispenser pack
TC-16LF	1-pint bottle with flip top (480 ml) 12/case
TC-16LR	1-pint bottle with sprayer (480 ml) 12/case
TC-35LF	1-quart bottle with flip top (95 ml) 12/case
TC-35LR	1-quart bottle with 6 sprayers (95 ml) 12/case
TC-128	1-gallon jug (3.8 l) 4/case
TC-384	3 gallons in 5-gallon pail (11.6 liter)
TC-640	5-gallon pail (18.0 liter)
TC-96	3-quarts in a 1-gallon pail (2.85 liter)
TC-D300	Dispenser w/300 5"X6" (16 cm X 13 cm) Pre-moistened wipes
TC-DRUM	55-gallon drum (210 liter)

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Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ Software

American Polywater® Corporation

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http://www.polywater.com(URL) support@polyhwater.com (e-mail)

Type FO™

Anhydrous Isopropyl Alcohol

- **99.8% Anhydrous Isopropyl Alcohol**
- **Excellent Solvency**
- **No Residue**
- **Fast Evaporating**
- **Non-Abrasive**
- **Convenient Packages**



Type FO™ Anhydrous Isopropyl Alcohol has essentially no water content. Type FO™ is great for cleaning fiber optics and associated equipment. It quickly removes dust, oils, and contaminants, while leaving no residue.

Type FO™ is available in convenient pre-saturated towelettes which are convenient for field use and eliminate spill hazards and vapor exposure. Towelettes are durable and non-linting.

Bulk packages available including a 2 oz. spray bottle and larger packages described below.

Catalog #	Description	Units per case
FO-1	5” x 8” Saturated Towelette	50
FO-2LP	2 oz Refillable Spray Bottle	12
FO-8LF	8 oz Refillable Bottle w/Flip top	12
FO-16	16 oz Bottle	12
FO-32	32 oz Bottle	12
FO-128	1 gal Jug	4

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LIT-FOFLYER/REV000

www.polywater.com/typefo.asp

Polywater® QuicKleen™

FIBER OPTIC CLEANER



Cleaning fiber with a QC-2LP spray bottle

Fast Evaporating Cleaner for Ferrules, Bulkheads, and Fiber End Faces

PRODUCT BENEFITS

- **Cleans Fiber End Faces:** Minimizes signal loss and maximizes connectivity.
- **No Flash Point:** Non-hazardous for air shipment.
- **Cleans Multi-Mode and Single Mode:** Suitable for all glass fiber, including 1625 nm.
- **No Residue:** No streaking ensures complete light transmission.
- **Evaporates Quickly:** Ready to reinsert or connect immediately after cleaning.

Maximize Optical Network Performance

QuicKleen™ is a unique solvent blend that cleans completely, evaporates quickly, and leaves no residue. QuicKleen Fiber End Face Cleaner is available in a convenient 2 fl. oz./60-mL spray bottle as part of an all-inclusive kit.



QC-KIT2 in convenient travel bag



QC-2LP spray bottle



QC-2LP case of 12

The QuicKleen Primary Package is a Small, Convenient Spray Bottle

This QuicKleen spray bottle is effectively used with FiberKleen™ towelettes. These microfiber towelettes can be used to clean ferrules, bulkheads, and fiber end faces. The nonwoven, highly absorbent towelettes trap the removed dirt and debris, making cleaning easier and more effective. Swabs are also available for insertion cleaning.

POLYWATER QUICKLEEN

Catalog #	Package Description	Units/Case
QC-2LP	2 fl. oz./60-mL bottle with finger sprayer	12
QC-KIT2	2 - QC-2LP; 1 - DT-D175; 1 - SWB-250F100; travel bag	1
DT-D175	175-count dispenser pack of microfiber towelettes with cleaning pad	12
DT-D175R	Refill for DT-D175	6
SWB-250F100	2.5-mm FiberKleen foam swab (100/pack)	5
SWB-125F10	1.25-mm FiberKleen foam swab (10/pack)	5
SWB-C100	FiberKleen cotton swab (100/pack)	5
SWB-V100	V Groove FiberKleen foam swab (100/pack)	5
SWB-M100	Mirror FiberKleen foam swab (100/pack)	5

SPECIFICATIONS AND APPLICATIONS:

- **Testing Standards:** Passes the rigorous standards of Telcordia GR 2923-CORE, “Generic Requirements for Fiber Optic Connector Cleaning Products”.
- **Safety:** Minimal toxicity and contains no listed carcinogens. Cleaner is non-flammable.
- **Compatibility:** Compatible with most common plastics and rubbers.
- **Temperature Use Range:** 20°F to 120°F (-5°C to 50°C).

CONTACT US

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email: support@polywater.com

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American Polywater® Corporation

11222 60th Street N | Stillwater, MN 55082 USA

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QuicKleen™
Performance Fiber Cleaner

American Polywater® Corporation

TECHNICAL DATA SHEET

Description:

QuicKleen™ Fiber Cleaner is formulated for fast cleaning of high speed fiber and specialty optics. It quickly penetrates precision parts to lift drywall dust, buffer gel, lint, finger prints, and oils. The excellent cleaning capabilities of QuicKleen™ minimize dB losses to maximize optical network performance.

QuicKleen™ Fiber Cleaner evaporates quickly without residue. The fast-drying character means solvent is not trapped in the connector to reduce signal loss. QuicKleen™ dissipates static and removes surface charge so that the surface is less likely to be re-contaminated. QuicKleen™ is non-flammable and safe to use.

QuicKleen™ Fiber Cleaner is packaged in an easy to use pump sprayer that allows precise cleaner application which limits waste and contamination. Polywater's non-woven FiberKleen™ towelettes trap dirt and absorb contaminants from high speed fiber and optical equipment. A smooth wiping surface and durable material promote easy, effective cleaning.

Performance Properties:

QuicKleen™ Fiber Cleaner is a high performance optical cleaner. QuicKleen™ removes a broad variety of endface contaminants.

Soil Type	Cleaning Effectiveness
Dry/Ionic Soil (dust, salt)	Excellent
Wet/Non-Ionic Soil (oil, buffer gel)	Excellent
Combination Soil	Excellent

QuicKleen™ Fiber Cleaner has been tested to the rigorous standards of Telcordia GR 2923-CORE, "Generic Requirements for Fiber Optic Connector Cleaning Products."



Product Benefits:

- Evaporates Quickly
- Maximizes Connectivity
- No Residue
- No Streaking
- Dissipates Static
- Non-Flammable
- Easy to Transport

End Use:

QuicKleen™ Fiber Cleaner is an excellent choice for cleaning precision fiber-optic components such as:

- Endfaces
- Single-mode Fiber
- Multi-mode Fiber
- Ferrules
- Bulkheads
- Lenses, Mirrors

Approvals:

- Meets Telcordia GR 2923-CORE, "Generic Requirements for Fiber Optic Connector Cleaning Products."
- RoHS and WEEE compliant

Physical Properties:

QuicKleen™ Fiber Cleaner is a high-purity, optical grade cleaner.

Property	Result
Residue	< 100 ppm
Flash Point (ASTM D93)	None
Initial Boiling Point	131°F (55°C)
Specific Gravity	1.48
Evaporation Rate	Fast

Environmental Impact:

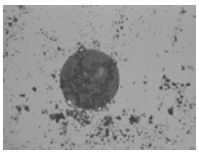
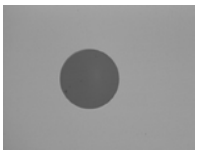
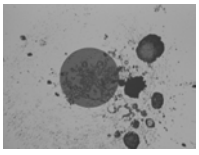
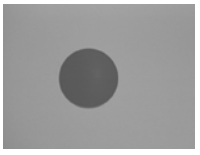
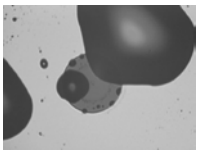
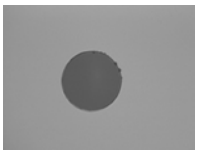
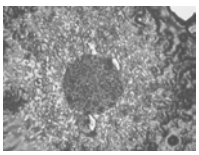
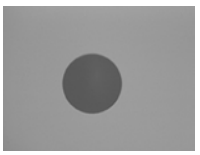
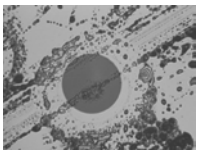
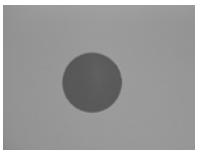
Property	Result
VOC Content	67 g/L
Global Warming Potential	310
Ozone Depletion Potential	0
CFC, HCFC Content:	None
RCRA	Not regulated as hazardous waste
CERCLA/SARA Status	Not regulated as a hazardous substance
RoHS and WEEE	Compliant
REACH	Compliant

Safety:

QuicKleen™ Fiber Cleaner has minimal toxicity and does not contain any listed carcinogens. Good industrial hygiene practice and appropriate precautions should be employed during use. See SDS for specific details.

Cleaning Properties:

QuicKleen™ Fiber Cleaner removes a broad range of contaminants from fiber connectors. To prove this, reference reflectance and transmitted power is measured on an unsoiled test connector at 1310 nm, 1550 nm, and 1625 nm. Then the rear-end connector plug is removed and soiled according to standard[1]. Connector end adapter is cleaned using recommended procedure. Insertion loss and reflectance are measured and compared to control. An electronic image of each cleaning is recorded.

Soil	Image – Soiled	Image – 1st Cleaning
Gypsum		
Carbon Black		
Olive Oil		
Gypsum/ Buffer Gel		
Gypsum/ 10W30 Oil		

Soil	Insertion Loss	Reflectance
Gypsum	Pass (<0.05 dB loss)	Pass (<2 dB change)
Carbon Black	Pass (<0.05 dB loss)	Pass (<2 dB change)
Olive Oil	Pass (<0.05 dB loss)	Pass (<2 dB change)
Gypsum/Buffer Gel	Pass (<0.05 dB loss)	Pass (<2 dB change)
Gypsum/10W30 Oil	Pass (<0.05 dB loss)	Pass (<2 dB change)

[1] *Tested using methods from Telcordia GR-2923-CORE, "Generic Requirements for Fiber Optic Connector Cleaning Products."*

Compatibility:

QuicKleen™ Fiber Cleaner is compatible with most common plastics and rubbers.

Polycarbonate:
Injection-molded plaques of polycarbonate are cut into bars, 2½ inch by ½ inch. Samples are bent in a three-point fixture. Percent strain is calculated based on the bar thickness and the radius of curvature.

"Strain limit" is the greatest percent strain where no stress cracking occurs. A strain limit greater than 0.5% indicates strain resistance.

Strain Limit > 0.5%

QuicKleen™ Fiber Cleaner shows good compatibility with polycarbonate.

Cladding:
Fiber cladding (Corning Cable) is firmly wiped 5 times with a cleaner-saturated towel. Towel and cable are visually inspected for cladding transfer or damage.

Cladding shows no visible damage.

QuicKleen™ Fiber Cleaner shows good compatibility with fiber cladding.

Soak Testing:
Materials are immersed in QuicKleen™ Fiber Cleaner for an hour at 50°C (122°F). Rubbers may swell slightly, but will return to their original state once the cleaner evaporates.

Plastic	Compatibility
Nylon 66	Excellent
Polycarbonate	Excellent
Polyethylene (HDPE)	Excellent
Polyethylene (LDPE)	Excellent
PVC	Excellent

Rubber	Compatibility
Silicone Rubber	Excellent
EPDM	Excellent

Usage Directions:

QuicKleen™ Fiber Cleaner is best used with the combination wet/dry cleaning procedure recommended in Telcordia GR-2923-CORE. Microfiber towels (DT-D175) available from American Polywater Corporation work well with this method.

A light spray of cleaner is placed on the towel. Preferred cleaning motion is a straight-line motion, drawing the endface through the wetted portion of the towel, and then through a clean portion of a second dry towel. Swabs may be dampened on the wetted portion of the towel in order to clean the alignment adaptor or scope.

Application Properties:

Temperature Use Range:
20°F to 120°F (-5°C to 50°C)

Storage and Shelf Life:
Keep containers tightly closed when not in use. Shelf life is 2 years.

Packaging:

QuicKleen™ Fiber Cleaner is packaged in a safety sealed container that resists spills, leaks, and contamination. The 2-fluid ounce spray bottle has over 500 uses.

Microfiber Towels:
FiberKleen™ Dry Towels offer high absorbency and are made from non-linting, non-fraying, ultra-clean material. This specialty microfiber fabric is engineered for optimum particle entrapment. The durable towel has a smooth surface for easy cleaning. It meets Telcordia Specification.



Convenient Kit Packaging and Cleaning Accessories

Model Specification:

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

The fiber cleaner shall be effective on both ionic and non-ionic soils. It shall meet the cleaning criteria of Telcordia GR 2923-CORE, "Generic Requirements for Fiber Optic Connector Cleaning Products." It shall contain an oxygenated solvent component for static dissipation.

The cleaner shall be fast evaporating and non-flammable. It shall leave minimal residue of less than 100 ppm. The cleaner shall be compatible with fiber optic components. It shall not stress crack polycarbonate and shall have a strain limit greater than 0.5%.

The cleaner shall not contain an aerosol propellant. It shall be packaged in a plastic bottle that allows cleaner to be dispensed in a fine mist spray pattern.

Order Information:

Cat #	Package Description
QC-2LP	2-oz QuicKleen™ Fiber Cleaner Finger Sprayer
QC-KIT2	QuicKleen™ Fiber Cleaner Kit: 2 QC-2LP 3 DT-D50 1 SWB-250100
SWB-250100	2.5 mm FiberKleen™ foam swab (100 pack)
SWB-125F10	1.25 mm FiberKleen™ foam swab (10 pack)
SWB-C100	FiberKleen™ cotton swab (100 pack)
SWB-V100	V Groove FiberKleen™ foam swab (100 pack)
SWB-M100	Mirror FiberKleen™ foam swab (100 pack)
DT-D50	50 non-linting towels in a sealed pocket case
DT-D175	125 microfiber towels, in a sealed case with cleaning pad
DT-D175R	Refill roll of microfiber towels (125) for DT-D175

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Cleaners

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Polywater® Type HP™

MULTIPURPOSE CLEANER



Use presaturated, lint-free wipes

Cleaner Degreaser for Electrical Construction and Maintenance Needs

PRODUCT BENEFITS

- **Multipurpose:** One cleaning solvent for electrical applications.
- **High Solvency:** Excellent for cable splice preparation and electrical equipment cleaning.
- **No Residue:** Type HP evaporates completely, leaving no residue.
- **Non-Conductive:** Will not short across typical electrical voltages.
- **Safe:** Replaces chlorinated electrical cleaners. No carcinogens.

The Industry's Preferred Electrical Cleaner

Polywater® Type HP™ is our most popular electrical cleaner for cable splice preparation, cable termination, and electrical apparatus maintenance. HP fits the needs of electrical utilities, line contractors, and medium voltage crews that need to comply with regulatory and safety requirements.



Catalog # HP-P158ID



Residue from cleaning

polywater.com | 651-430-2270

American Polywater® Corporation



Catalog # HP-D72



Type HP package options

Packaged for Large Jobs and Precision Cleaning

Polywater Type HP is available in a large variety of bulk packages and splice preparation kits. The unique HP Tandem Pack™ contains a saturated wipe for cleaning and a lint-free drying wipe to speed evaporation, if needed. PEL-PAC® prep kits contain saturated wipes, sanding cloth, and dry wipes in convenient packaging that limits solvent exposure.

POLYWATER TYPE HP

Catalog #	Package Description	Units/Case
HP-1	Saturated 8” x 12”/20 cm x 30 cm wipe	144
HP-P158ID	Tandem Pack wet/dry 5” x 8”/12 cm x 20 cm wipe	144
HP-3PS	PEL-PAC kit contains: 3 - HP-P158ID wet/dry wipes; 1 - strip 120-grit non-conductive sanding cloth	10
HP-P63	PEL-PAC kit contains: 6 – HP-P158ID wet/dry wipes; 3 – strips 120-grit non-conductive sanding cloth; 1 – instruction card	12
HP-T369	PEL-PAC kit contains: 3 - saturated 6” x 9”/15 cm x 23 cm wipes in a tin	24
HP-T369/S	Same as kit above; includes sandpaper	24
HP-T369/S-D	Same as kit above; includes dry towel	24
HP-D72	Dispenser with 72 - 10” x 12”/25 cm x 30 cm wipes	6
HPY-12	16-oz. aerosol can (475 mL)	12
HP-16LF	1-pt. bottle with flip top (475 mL)	12
HP-35LF	1-qt. bottle with flip top (.95 liters)	12
HP-128	1-gal. bottle (3.8 liters)	4
HP-640	5-gal. can (18.9 liters)	1
HP-DRUM	55-gal. drum (208 liters)	1

SPECIFICATIONS AND APPLICATIONS:

- **Cable Compatible:** Meets the standard electrical utility test requirements based on IEEE 1493 cable cleaning standard.
- **Dielectric Strength:** >40KV at a 100-mL gap per ASTM D877 standard test method.
- **Flashpoint:** >140°F (60°C) per ASTM D93 standard test method.
- **Residue:** <100 ppm per ASTM D2369 standard test method. Leaves no residue.
- **Exposure:** PEL-PACs limit solvent vapors in enclosed environments.

CONTACT US

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email: support@polywater.com

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American Polywater® Corporation

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Type HP™
Multi-Purpose Cleaner

American Polywater® Corporation

TECHNICAL DATA SHEET

Description:

Type HP™ Cleaner effectively cleans semi-conducting cable shield, corrosion inhibiting compound, silicone greases, filling gels, transformer oils and many other contaminants found in electrical construction and maintenance. It evaporates with no residue. Type HP™ is non-conductive.

Type HP™ Cleaner replaces ozone-depleting CFC's, trichloroethane and other carcinogenic chlorinated solvents. Type HP™ Cleaner lasts longer than fast evaporating solvents and is compatible with most materials and plastics, including polycarbonate.

Type HP™ Cleaner is available in multiple package options. Bulk Type HP™ Cleaner is an excellent choice for soaking or rinsing parts. Pre-saturated towels limit solvent exposure and eliminate spill hazard. Depending on end use, Type HP™ Cleaner has the optimal package available.

Performance Properties:

Type HP™ Cleaner meets IEEE 1493 performance criteria[1]. It effectively cleans semi-conducting cable shield. A towel saturated with cleaner quickly removes the compound and becomes visibly black.

Property	Result
Cleaning Effectiveness	Excellent
KB Value	33
Hildebrand Solubility Parameter	7.5
Dielectric Strength 100 mil gap (ASTM D877):	>40 KV
Water Content (ASTM D1533B)	< 50 ppm
Evaporation Rate	Medium
Residue (ASTM D2369)	<100 ppm

[1] Tested using methods from IEEE 1493, "Guide for the Evaluation of Solvents Used for Cleaning Electrical Cables and Accessories."



Product Benefits:

- Excellent Solvency
- No Residue
- Non-Conductive
- Contains No Chlorinated Solvents
- Compatible with Most Plastics and Rubbers
- Multiple Package Options

End Use:

- Transformers
- Switch Gear
- Motor Control Devices
- Fusible Disconnecting Devices
- Wind Turbine Nacelles
- Relays
- Generators
- Motors
- Circuit Boards
- Rheostats
- Tools

Physical Properties:

Type HP™ Cleaner is a high purity solvent with low aromatic content.

Property	Result
Flashpoint (ASTM D93)	>140°F (60°C)
Initial Boiling Point	365°F (185°C)
Specific Gravity	0.79
Percent Aromatics	< 1%

Cleaning Properties:

Type HP™ Cleaner dissolves a broad range of contaminants. Contaminant is added to 20 grams cleaner at ambient temperature. The quantity dissolved is recorded.

Contaminant	Amount Dissolved
PCB (Aroclor® 1260)	10 grams
Cutting oil (Rigid Nu-Clear, sulphurized oil)	10 grams
Silicone grease (Dow Corning 4 Compound)	2 grams
Animal oil (Lanolin-Tech Grade)	2 grams

Usage Directions:

Type HP™ Cleaner is suitable for many types of cleaning and degreasing and is effective at room temperature. It does not freeze and can be used in cold weather applications.

Cleaning time and effectiveness will vary based on the contaminant and cleaning method. Wiping or agitation cleans faster than just soaking. Experiment with your particular contaminant and conditions.

Type HP™ Cleaner is residue-free. For precision cleaning, a final rinse of fresh cleaner should be used. Finish with a fresh wipe, spray until the solvent runs clear, or rinse in a fresh bath of Type HP™ cleaner.

For faster drying, air or centrifugal dryers can be used to accelerate evaporation. Wiping the part with an absorbent, lint-free towel (Cat.# DT-69) will reduce drying time considerably.

Drying Time Comparisons:

No Drying:	60-90 Mins.	Cool Air:	3-5 Mins.
Drying Wipe:	1-2 Mins.	Hot Air:	2-3 Mins.

Safety:

Type HP™ Cleaner has a low level of toxicity and does not contain any listed carcinogens. It is combustible and should not be exposed to fire or flame. Good industrial hygiene practice and appropriate precautions should be employed during use. See SDS for specific details.

Pel Pac System

Type HP™ Cleaner presaturated towelettes are a convenient package with multiple safety benefits.

Control
Presaturated wipes minimize solvent exposure on sensitive electrical parts. Directly spraying or immersing the part allows the solvent to puddle into small openings. Wipe cleaning will also ensure that the solvent evaporates more quickly.

Safety
The presaturated towelette package eliminates spill hazard and limits solvent vapor exposure. Wipes contain a carefully measured quantity of solvent and are an excellent way to control vapor. Type HP™ Cleaner presaturated towelettes are a great choice for underground or confined space applications.

Convenience
Each Pel-Pac package utilizes non-linting, non-tearing towels. Clean wipes are always available, eliminating recontamination of parts with dirty rags. Custom kits may include extra dry towels or abrasive cloth as needed.



Convenient Wet/Dry Tandem Pack (HP-P158ID) controls solvent exposure.

Environmental Impact:

Type HP™ Cleaner is a safer alternative to chlorinated solvents.

Property	Result
VOC Content	790 grams/liter
Global Warming Potential	Does not contain global warming compounds
Ozone Depletion Potential	None
CFC, HCFC, HFC Content:	None
RCRA	Not regulated as hazardous waste
CERCLA/SARA Status	Not regulated as a hazardous substance

Compatibility:

Type HP™ Cleaner is compatible with most common plastics and rubbers. It meets standard electrical utility test requirements based on IEEE 1493.

Plastic Materials - XLPE
XLPE jacket material immersed in Type HP™ Cleaner retains tensile and elongation characteristics and shows minimal weight change[1].

Rubber Materials – EPDM and Silicone Rubber
Platen samples of EPDM and Silicone Rubber immersed in Type HP™ Cleaner retain tensile and elongation characteristics and show minimal weight change[1].

Volume Resistivity of Cable Insulation Shield
Type 0691 XLPE immersed in Type HP™ Cleaner shows acceptable volume resistivity values[1]. After exposure to the cleaner, volume resistivity measurements return to control levels.

Corrosivity:
Type HP™ Cleaner will not corrode or stain metal parts. It does not tarnish or corrode copper[2].

[1] Tested using methods from IEEE 1493, "Guide for the Evaluation of Solvents Used for Cleaning Electrical Cables and Accessories."

[2] Testing based on ASTM D130, "Standard Test Method for Detection of Copper Corrosion from Petroleum Products by the Copper Strip Tarnish Test."

Soak Testing:

Materials are immersed in Type HP™ Cleaner for 72 hours at 50°C (122°F). Some rubbers will swell, but should return to their original state once the cleaner evaporates. Wipe cleaning minimizes solvent exposure.

Plastics	% Weight Change	Appearance
ABS	+0.04	NC
Acrylic	-0.01	NC
Delrin®	+0.03	NC
Epoxy	0.00	NC
Nylon 66	-0.02	NC
Nylon 101	+0.07	NC
Polycarbonate	+0.04	NC
Phenolic	-0.05	NC
PPO	+0.02	NC
PVC	+0.01	NC
Teflon®	+0.03	NC
Tygon®	-0.25	NC
Ultem® 1000	-0.01	NC
Valox® 420	0.00	NC

Elastomers	% Weight Change	Appearance
Neoprene®	+9.31	SS
Nitrile	-2.01	NC
SBR	+47.34	S
Viton®	+0.07	NC

KEY:

NC = No Change
S = Swelling
ES = Extreme Softening
C = Crazing
SS = Slight Swelling
D = Disssolved

Testing based on ASTM D543, "Standard Test Method for Resistance of Plastics to Chemical Reagents."

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Model Specification:

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

The cleaning solvent shall be at least 80% high purity, dearomatized, aliphatic hydrocarbon enhanced with a cyclic terpene. Aromatic content shall be less than 1%. Water content shall be less than 75 ppm.

The cleaner shall not leave a residue. The cleaner shall not significantly affect the volume resistivity of Union Carbide 0691 XLPE cable insulation shield. The cleaner shall show a voltage withstand of at least 40 kV before breakdown.

The cleaner shall not significantly affect the tensile and elongation properties of XLPE, silicone rubber, and EPDM rubber when tested to guidelines proposed in IEEE P1493. When wiped over an XLPE (Union Carbide Type 0691) insulation shield, a clean towel wetted with the cleaner shall become visibly "black" with two wipes over 2-inches of cable length with light hand pressure.

The cleaner shall not be a carcinogen or listed by CERCLA as a hazardous waste. It shall not be on the EPA Phase I or Phase II list of banned or phased-out chlorofluorocarbons.

Order Information:

Cat #	Package Description
HP-1	Single, saturated towelette 144/case
HP-P158ID	Wet/dry wipe Tandem Pack™ 144/case
HP-D72	72-Count Wipe Canister 6/case
HPY-12*	16-oz aerosol can 12/case
HP-16LF	1-pint bottle with flip top (475 ml) 12/case
HP-35LF	1-quart bottle with flip top (.95 Liter) 12/case
ST-R	Trigger sprayer, fits pint and quart bottles 12/case
HP-128	1-gallon bottle (3.8 Liter) 4/case
HP-640	5-gallon can (18.0 Liter)
HP-DRUM	55-gallon drum
HP-P63	Tandem Pack™ Cable Prep Kit contains 6 HP-P158ID wet/dry wipes 3 strips 120-grit non-conductive aluminum oxide sanding cloth 1 instruction card 12/case
HP-T369	Pel-Pac® Kit, 3 saturated towels in sturdy tin 24/case
HP-T369/S	Pel-Pac® Kit with sandpaper 24/case
HP-T369/S-D	Pel-Pac® Kit with sandpaper and dry towel 24/case
DT-1212	Non-linting, 12" X 12" dry towels 100/box
DT-69	Non-linting, 6" X 9" dry towels 200/box

**Government NSN # 6850-01-387-4567 for HPY-12*

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Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ Software

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Polywater® Type RP™

FAST-EVAPORATING CABLE CLEANER



Catalog # RP-1 presaturated lint-free towelette

Medium & High Voltage Cable Preparation Cleaner/Degreaser

PRODUCT BENEFITS

- **Safe:** Excellent alternative to brominated and chlorinated solvents.
- **Versatile:** Available in PEL-PAC® towelettes or aerosol cans.
- **Fast Evaporation:** Evaporates quickly and leaves no residue.
- **Tested:** High dielectric strength of 56Kv meets IEEE 1493.
- **Proven:** Approved by medium voltage cable manufacturers.

All-Around Electrical Cleaning Solution

Polywater® Type RP™ Rapid Power medium voltage cable cleaner evaporates quickly without the health and safety issues of other volatile cable cleaners. Type RP is packaged several ways to make cleaning and maintenance safer and easier.



Lint-free wipes leave no residue



Catalog # RP-16



Removing transformer oil residue



Type RP package options

Type RP Makes Cleaning Effortless

The PEL-PAC single wipes are lint-free and saturated with the optimal amount of solvent for the job. The RP-1L wipes easily fit into tool bags, nose bags, and splicer tool buckets. Prepackaged wipes ensure the use of a lint-free towel, limit the solvent exposure, eliminate waste, and properly prep the cable. Using too much solvent to clean cables can result in pooling of the solvent, potentially causing tracking failure.

The RP-16 aerosol is best suited for cleaning busbars, transformer oils, switchgear, meters, and electric motors. The versatile RP-16 also satisfies numerous other degreasing needs.

POLYWATER TYPE RP

Catalog #	Package Description	Units/Case
RP-1	Saturated 5” x 8”/12 cm x 20 cm wipes	96
RP-1L	Saturated 8” x 12”/20 cm x 30 cm wipes	144
RP-P63	6 - Type RP cleaning wipes (cat # RP-1) 3 - strips of sanding cloth 1 - instruction sheet	12
RP-16	16 fl. oz. aerosol can (475 mL)	12

SPECIFICATIONS AND APPLICATIONS:

- **Cable Compatible:** Meets the standard electrical utility test requirements based on IEEE 1493 cable cleaning standard.
- **Dielectric Strength:** >56KV at a 100-mL gap per ASTM D877 standard test method.
- **Flashpoint:** >19°F (60°C) per ASTM D93 standard test method.
- **Residue:** <100 ppm per ASTM D2369 standard test method. Leaves no residue.

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American Polywater® Corporation

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Type RP™
Rapid Power Cleaner

American Polywater® Corporation

TECHNICAL DATA SHEET

Description:

Type RP™ Cleaner effectively cleans semi-conducting cable shield, corrosion inhibiting compound, silicone greases, filling gels, transformer oils and many other contaminants found in electrical construction and maintenance.

Type RP™ Cleaner evaporates quickly and does not leave a residue. Type RP™ has excellent dielectric properties and is non-conductive. Type RP™ Cleaner is compatible with most materials and plastics, including polycarbonate.

Type RP™ Cleaner is available in convenient pre-saturated towelettes. Use of individual towels limits solvent exposure and eliminates spill hazard.

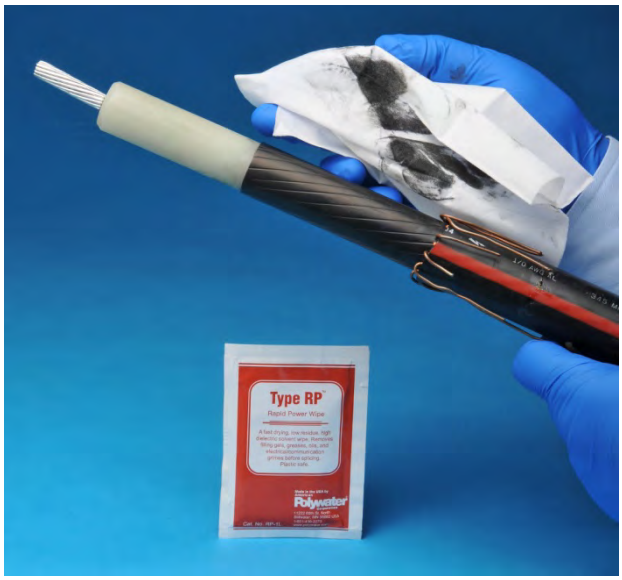
Cleaning Properties:

Type RP™ Cleaner meets IEEE 1493 performance criteria[1]. It effectively cleans semi-conducting cable shield. A towel saturated with cleaner quickly removes the compound and becomes visibly black. Type RP™ Cleaner dissolves a broad range of contaminants.

Type RP™ Cleaner has excellent solvency across a broad spectrum of grimes. Contaminant grease is spread onto a polyethylene plaque with 6 mm thick ribbons. The plaque is immersed in RP™ Cleaner and agitated. Cleaning time is noted.

Contaminant	Cleaning Time
Silicone Grease, DC #4	<60 seconds
Dielectric Oil	<30 seconds
Hydrocarbon Grease	<30 seconds
Aluminum Oxide Grease	<60 seconds

[1] Tested using methods from IEEE 1493, "Guide for the Evaluation of Solvents Used for Cleaning Electrical Cables and Accessories."



Type RP™ Rapid Power is fast evaporating and effective

Product Benefits:

- Fast Evaporation
- Excellent Solvency
- No Residue
- Non-Conductive
- Contains No Chlorinated Solvents
- Compatible with Most Plastics and Rubbers

End Use:

- Splicing and Terminating Cables
- Cleaning Relays, Generators, Motors, Circuit Boards and other Electrical Equipment
- Maintaining Transformers and Switch Gear
- Preparing Surfaces for Adhesives, Sealants and Tapes

Performance Properties:

Property	Result
Cleaning Effectiveness	Excellent
Dielectric Strength 100 mil gap (ASTM D877):	56 KV
Evaporation Rate	Fast (similar to alcohol)
Residue (ASTM D2369)	<100 ppm (None)

Usage Directions:

To prepare cable for splice, buff the insulation with the abrasive strip to remove any conductive material remaining on the insulation. The surface should be smooth with no particle contaminants.

Clean the cable insulation with the Type RP™ Cleaning Wipe. Wipe away from the conductor towards the insulation shield. Turn the solvent towelette after each wipe, using a fresh portion of the towel each time. It is important not to wipe material from the insulation onto the insulation shield. Do not wipe the insulation shield. RP™ Cleaning Wipes can also be used to clean the cable jacket for improved adhesion of mastics and tapes used in splicing and termination.

For general electrical cleaning, follow manufacturers' instruction. RP™ Cleaning Wipes are fast evaporating. Do not open until ready to use.

Environmental Impact:

Type RP™ Cleaner is a safer alternative to chlorinated solvents.

Property	Result
VOC Content	720 grams/liter
Global Warming Potential	Does not contain global warming compounds
Ozone Depletion Potential	None
CFC, HCFC, HFC Content:	None
RCRA	Not regulated as hazardous waste
CERCLA/SARA Status	Not regulated as a hazardous substance

Safety:

Type RP™ Cleaner has a low level of toxicity and does not contain any listed carcinogens. It is flammable and should not be exposed to fire or flame. Towelette package limits hazard. Good industrial hygiene practice and appropriate precautions should be employed during use. See SDS for specific details.

PEL-PAC® System

Type RP™ Cleaner pre-saturated towelettes are a convenient package with multiple safety benefits.

Control
Pre-saturated wipes minimize solvent exposure on sensitive electrical parts. Directly spraying or immersing the part allows the solvent to puddle into small openings. Wipe cleaning will also ensure that the solvent evaporates more quickly.

Safety
The pre-saturated towelette package eliminates spill hazard and limits solvent vapor exposure. Wipes contain a carefully measured quantity of solvent and are an excellent way to control vapor. Type RP™ Cleaner pre-saturated towelettes are a great choice for underground or confined space applications.

Convenience
Each PEL-PAC® package utilizes non-linting, non-tearing towels. Clean wipes are always available, eliminating recontamination of parts with dirty rags.



Convenient pre-saturated towelettes (RP-1L, RP-1) control solvent exposure.

Physical Properties:

Type RP™ Cleaner is a high-purity solvent with low aromatic content.

Property	Result
Flashpoint (ASTM D93)	19°F (-7°C)
Initial Boiling Point	144°F (62°C)
Specific Gravity	0.72

Compatibility:

Type RP™ Cleaner is compatible with most plastics and rubbers. It meets standard electrical utility test requirements based on IEEE 1493.

Plastic Materials - LLDPE
LLDPE jacket material immersed in Type RP™ Cleaner retains tensile and elongation characteristics and shows minimal weight change[1].

Rubber Materials – EPDM and Silicone Rubber
Platen samples of EPDM and Silicone Rubber immersed in Type RP™ Cleaner retain tensile and elongation characteristics and show minimal weight change[1].

Volume Resistivity of Cable Insulation Shield
Cables with either XLPE or EPR insulation show acceptable volume resistivity values after immersion in Type RP™ Cleaner [1]. After exposure to the cleaner, volume resistivity measurements return to control levels.

Corrosivity:
Type RP™ Cleaner will not corrode or stain metal parts. It does not tarnish or corrode copper[2].

Polycarbonate:
Injection-molded plaques of polycarbonate are cut into bars, and bent in a three-point fixture. “Strain limit” is the greatest percent strain where no stress cracking occurs. A strain limit greater than 0.5% indicates strain resistance.

Strain Limit > 0.5% (Stress Crack Resistant)[3]

[1] Tested using methods from IEEE 1493, “Guide for the Evaluation of Solvents Used for Cleaning Electrical Cables and Accessories.”

[2] Testing based on ASTM D130, “Standard Test Method for Detection of Copper Corrosion from Petroleum Products by the Copper Strip Tarnish Test.”

[3] Testing based on Mobay Corporation, Plastics and Rubber Division, “Chemical Compatibility Test for Unreinforced Thermoplastic Resins, 1989.”

Soak Testing:

Materials are immersed in Type RP™ Cleaner for 7 days at 22°C (72°F). Some rubbers will swell, but should return to their original state once the cleaner evaporates. Wipe cleaning minimizes solvent exposure.

Plastics	% Weight Change	Appearance
ABS	+4.09	NC
Acrylic	+0.59	SS
Delrin®	+0.07	NC
Epoxy	+1.77	NC
Nylon 66	+0.16	NC
Nylon 101	+0.14	NC
Polycarbonate	+0.09	NC
Phenolic	+6.64	NC
Noryl	+0.63	NC
PVC	+0.43	NC
Teflon®	+0.01	NC
Tygon®	-1.26	NC
Ultem® 1000	-0.04	NC
Valox® 420	+0.01	NC
HDPE	+2.39	NC
LDPE	+4.95	NC
SAN	+0.00	NC

Elastomers	% Weight Change	Appearance
Neoprene®	-12.48	H
Nitrile	-4.93	NC
SBR	-9.15	NC
Viton®	+2.52	NC
Natural Rubber	+0.25	NC
EPDM	-26.56	H

KEY:

NC = No Change
S = Swelling
ES = Extreme Softening
C = Crazing
SS = Slight Swelling
H = Hardens

Testing based on ASTM D543, “Standard Test Method for Resistance of Plastics to Chemical Reagents.”

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Model Specification:

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

The cleaner shall not leave a residue. The cleaner shall not significantly affect the volume resistivity of Union Carbide 0691 XLPE cable insulation shield. The cleaner shall show a voltage withstand of at least 40 kV before breakdown.

The cleaner shall not significantly affect the tensile and elongation properties of XLPE, silicone rubber, and EPDM rubber when tested to guidelines proposed in IEEE P1493. When wiped over an XLPE (Union Carbide Type 0691) insulation shield, a clean towel wetted with the cleaner shall become visibly "black" with two wipes over 2-inches of cable length with light hand pressure.

The cleaner shall not be a carcinogen or listed by CERCLA as a hazardous waste. It shall not be on the EPA Phase I or Phase II list of banned or phased-out chlorofluorocarbons.

Order Information:

Cat #	Package Description
RP-1	Single, saturated towelette (5"X8") 96/case
RP-1L	Single, slightly saturated towelette (8"X12") 144/case
RP-P63	Cable Preparation Kit includes: 6 RP-1 wipes 3 Strips 120-grit, non-conductive aluminum oxide sanding cloth 1 Instruction card 12/case
RP-16	16 fl. oz (475ml) aerosol can 12/case

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LIT-RPTECHSPEC/REV001

Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ Software

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ELECTRICAL MAINTENANCE AEROSOLS FROM AMERICAN POLYWATER



TR™ Cable Cleaner

- Powerful All Purpose Cleaner
- Closely Matches Trichlor's Characteristics
- No Flash Point, Non-Flammable
- Non Chlorinated, No Carcinogens
- Fast Evaporating

KC™ Contact & Equipment Cleaner

- No Flash Point, Non-Flammable
- Safe On Plastics
- Fast Evaporating
- No Carcinogens
- Cleans Relays, Contacts, & Cables

HP™ Multipurpose Cleaner/Degreaser

- Excellent Cable Cleaner
- High Flash Point
- Non-Chlorinated, Ozone Safe
- Longer Working Time

FD™ Electrical Degreaser/Contact Cleaner

- Fast Drying, Leaves No Residue
- Removes Contamination, Safe on Cables, Circuit Boards & Contacts
- Superior Solvency Power
- Non-Chlorinated, No Carcinogens

P7™ Multipurpose Oil

- Lubricates, Penetrates, Cleans
- Displaces Water, Seals out Moisture
- Extends Equipment Life
- Safe On Plastics

CG™ Cold Galvanize

- Prevents Rust & Corrosion
- Protects Steel Electrical Apparatus
- Excellent for Weld Coating
- Plastics Safe

Aerosol Ordering Matrix

Catalog #	Description	Units/Case
CG-13	16-oz aerosol can	12
FD-9	16-oz aerosol can	12
FD-35LF	32-oz bottle with flip top	12
FD-128	1-gallon jug	4
FD-640	5-gallon pail	1
FD-DRUM	55-gallon drum	1
HP-1	Saturated wipe in foil pack	144
HP-P158ID	Wet/Dry wipe Tandem Pack™	144
HPY-12	16-aerosol can	12
HP-16LF	16-oz bottle with flip top	12
HP-35LF	32-oz bottle with flip top	12
HP-128	1-gallon jug	4
HP-640	5-gallon pail	1
HP-DRUM	55-gallon drum	1
KC-16	16-oz aerosol can	12
P7-12	16-oz aerosol can	12
TR-1	Saturated 5”x8” wipe in sealed foil pouch	96
TR-1L	Saturated 8”x12” wipe in sealed foiled pouch	144
TR-16	16-oz aerosol can	12

To view technical information on our website go to:
Support Page: www.polywater.com/aerosols.html

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LIT-MROFLYER/REV0001

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Polywater® Type P7™

PENETRATING OIL



P7 protects locking mechanisms

Multi-Functional Penetrating Oil for Electrical and Industrial Use

PRODUCT BENEFITS

- **Protects:** Extends equipment life by providing a protective film.
- **Displaces Water:** Seals out moisture and dries out ignitions.
- **Penetrates:** Loosens stuck metal parts and apparatus.
- **Safe:** Harmless to most plastics and safe on metal, paint, and rubber.
- **Non-Conductive:** Leaves a protective film that is non-conductive.

Lubricate, Safeguard, and Maintain Field Apparatus

Type P7™ Penetrating Oil is suitable for all kinds of electrical, industrial, and telecommunication uses. Type P7 works four ways: as a moisture displacer, rust preventative, lubricant, and penetrating oil. P7 eliminates the need to carry multiple products for separate tasks.



Liberally apply P7 to loosen



Nozzle precisely directs P7

polywater.com | 651-430-2270

American Polywater® Corporation



Loosening pole line bolts



Catalog # P7-12

One Product for Multiple Jobs

P7 Penetrating Oil is excellent for preventing electrical disruption caused by moisture penetration. P7 is ideal for pole line hardware, transformers, connectors, circuit breakers, controls, chucks, relays, communication assemblies, motors, starters, cabinets, and enclosures. P7 penetrates quickly to loosen stuck or frozen parts. Use P7 to maintain and lubricate equipment and motors. Service crews utilize P7 for maintaining substations, wind farms, solar arrays, and DOT apparatus. It displaces moisture, which is critical to restoring electrical or electronic equipment systems damaged by water ingress. Refer to our storm damage restoration procedure below for more information on the proper way to bring electrical systems back online after flooding.

POLYWATER PR

Catalog #	Package Description	Units/Case
P7-12	16-oz. aerosol can (475 mL)	12

SPECIFICATIONS AND APPLICATIONS:

- **Properties:** Flashpoint (ASTM D93) 100˚F/38˚C, Initial Boiling Point 245˚F/118˚C, Specific Gravity 0.69, Dielectric Strength (ASTM D877) 13 KV, USDA Approved.
- **Compatibility:** P7 Multipurpose Oil is compatible with most plastics and elastomers. Testing is based on a soak test described in ASTM D 543. P7 Oil will temporarily affect some rubber compounds, but they should return to their original state after the solvent carrier has dried. It is recommended that all plastic parts, gaskets, seals, and O-rings be tested for specific use and exposure method.
- **Water Displacement:** P7 Multipurpose Oil displaces moisture and dries out ignitions. It creeps under water and ice, dissolving and carrying away these contaminants. A non-conductive, protective film is left behind. P7 Oil displaces water according to the procedure described in Mil-Spec C-16173E. No rusting or mottling was observed on the treated surface.
- **Storm Restoration Procedure:** www.polywater.com/wp-content/uploads/pdf/LIT-STORM-DAMAGE-10-05.pdf

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American Polywater® Corporation

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Technical Bulletin

American Polywater's

P7™

Multipurpose Oil

Multipurpose Penetrating Oil for Industrial and Electrical Use

Description

P7™ Multipurpose Oil is suitable for all kinds of electrical and industrial uses. P7™ Oil cleans dirt and grime, loosens rust and scale, and penetrates frozen parts. Use it to maintain and lubricate equipment.

P7™ Multipurpose Oil is multi-functional. It cleans, penetrates, and lubricates to extend equipment life. P7™ Oil also acts as a moisture displacer and corrosion inhibitor. It drives out moisture and dries wet connections, leaving a protective film which is non-conductive.

Advantages

- Lubricates Moving Parts
- Frees Stuck Parts
- Protects Against Rust and Corrosion
- Displaces Moisture
- Removes Grime and Rust
- Film is Non-Conductive
- Harmless to Most Plastics
- Safe on Metal, Paint, & Rubber
- Contains No CFC's or Chlorinated Solvents
- Silicone-Free
- Cleans Tar, Grease, Rust, and Adhesives

Properties

Flashpoint (ASTM D93)	100°F/38°C
Initial Boiling Point	245°F/118°C
Specific Gravity	0.69
Dielectric Strength (ASTM D877)	13 KV
Relative Evaporation Rate	Fast
Propellant	Hydrocarbon
USDA	Approved



P7™
Multipurpose Oil Aerosol (cat. # P7-12) penetrates into tight spots and frees stuck parts.

Penetration and Cleaning

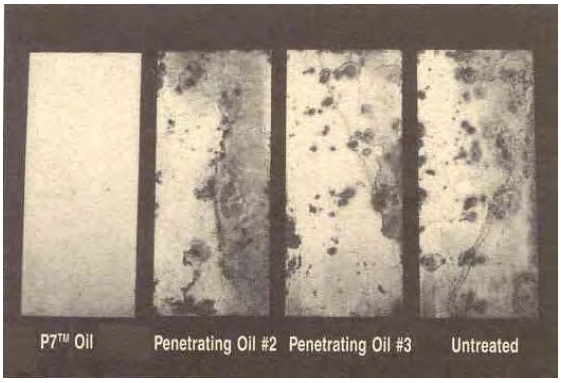
P7™ Multipurpose Oil cleans grease and tars and removes adhesives and rust. Other solvent cleaners are not necessary. P7™ Oil dissolves grit and grime contaminants, leaving behind a fine protective film.

P7™ Multipurpose Oil has a low surface tension, which allows it to spread into a very fine film. One 12-ounce can of P7™ Oil will cover approximately 300 square feet of surface. This low surface tension allows P7™ Oil to "creep" up surfaces against gravity. It will penetrate and coat 16mm of a threaded bolt in 15 minutes. P7™ Multipurpose Oil will lubricate tight crevices and loosen frozen parts.

Protection and Corrosion Prevention

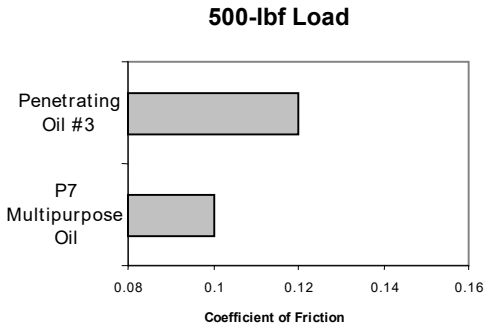
P7™ Multipurpose Oil offers superior corrosion protection by leaving a non-conductive film. This long-lasting film increases service life.

The photo below shows the results of a three-week outdoor weathering test run on low carbon steel. The plates were sanded, cleaned, and saturated with various penetrating oils. The steel plates were left in the elements, untouched for three weeks. P7™ acts as a tough, protective barrier; the steel plate has no rusting or mottling at the conclusion of the test.



Lubrication

P7™ Multipurpose Oil is an exceptional lubricant. The coefficient of friction can be determined using the Falex Pin and Vee Block Test Machine (ASTM D3233A). Load is applied to two V-blocks which press against a rotating steel journal immersed in the oil. The coefficient of friction value is derived from the torque measurement on the pin. The more the penetrating oil lubricates and lowers the torque, the lower the resulting coefficient of friction. Results documented in the following chart show that P7™ has a significantly lower coefficient of friction than another commonly used multipurpose oil.



Extreme pressure testing using the Pin and Vee Block Test Machine confirms P7™ Oil's excellent performance under high loads. The test will run to a load force of over 1,000 pounds before failure.

Water Displacement

P7™ Multipurpose Oil displaces moisture and dries out ignitions. It creeps under water and ice, dissolving and carrying away these contaminants. A non-conductive, protective film is left behind. P7™ Oil displaces water according to the procedure described in Mil-Spec C-16173E. No rusting or mottling was observed on the treated surface.

Compatibility

P7™ Multipurpose Oil is compatible with most plastics and elastomers. Tables I and II show the effect of P7™ Oil on various plastics and rubbers.

Testing is based on a soak test described in ASTM D 543. P7™ Oil will temporarily affect some rubber compounds. These rubbers may swell, but should return to their original state after the solvent carrier has dried. Immersion will affect sensitive materials more than incidental contact of a spray and wipe. It is recommended that all plastic parts, gaskets, seals and O-rings be tested for specific use and exposure method.

P7™ Compatibility with Plastics and Elastomers

TABLE I

PLASTICS	AGING 72 HOURS AT 50°C		
	% WEIGHT CHANGE	% THICKNESS CHANGE	APPEARANCE
ABS	+0.04	+0.79	NC
Acrylic	-0.02	-0.04	NC
CPE Thermoplastic	+16.10	+4.27	NC
CPE Thermoset	+22.12	+20.99	SS
Delrin®	+0.17	+0.25	NC
Epoxy	-0.05	0	NC
Nylon 101	-0.08	-1.57	NC
Polycarbonate	-0.03	-0.59	NC
Phenolic	+1.24	0	NC
Polyethylene	+14.19	+5.44	NC
Polystyrene	+13.85	-3.64	SF
PVC	+0.06	0	NC
Teflon®	+0.07	-0.25	NC
Tygon®	+4.95	0	NC
Ultem® 1000	-0.08	-0.27	NC
Valox® 420	+0.03	-1.11	NC

TABLE II

ELASTOMERS	AGING 72 HOURS AT 50°C		
	% WEIGHT CHANGE	% THICKNESS CHANGE	APPEARANCE
EPDM	+149.56	+43.77	S
Neoprene	+26.64	+9.79	SS
Nitrile	+1.06	0	NC
SBR	+52.48	14.36	S
Silicone	+48.04	+17.87	S
Viton®	+0.56	+0.26	NC

KEY:

NC=NO CHANGE
SS=SLIGHT SWELLING
SF=SOFTENING
S=SWELLING

Type P7™ is a trademark of American Polywater Corporation
Delrin®, Teflon®, and Viton® are trademarks of Du Pont
Ultem® 1000 and Valox® 420 are trademarks of G.E. Plastics
Tygon® is a trademark of Norton Performance Plastics

Usage Directions

Position nozzle 6 to 8 inches (15-20 cms) from surface and spray with light even strokes. Use extension tube for difficult to reach areas. Let P7™ Oil soak for several minutes to loosen rusted parts. Allow 4 to 6 hours to fully dry. P7™ Multipurpose Oil leaves a non-conductive, protective film.

Safety

P7™ Multipurpose Oil has a low level of toxicity. Avoid breathing spray, mist, or vapor. As with any solvent, ventilation should be sufficient to keep vapors at safe levels.

P7™ Multipurpose Oil is combustible. Do not expose to fire or flame. Good industrial hygiene practice and appropriate precautions should be employed during use.

Storage

P7™ Multipurpose Oil is classified as combustible. Keep containers cool, dry and away from sources of ignition and oxidizing materials. Do not expose aerosol cans to direct sunlight or temperatures above 120°F (50°C). Do not puncture or incinerate aerosol cans. Aerosol cans are freeze/thaw stable. This product has a shelf life of three years.

Package Options

Catalog No.	Description
P7-12	10-wt. oz. aerosol can in 16 oz can

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American Polywater expressly disclaims any implied warranties and conditions of merchantability and fitness for a particular purpose. American Polywater's only obligation shall be to replace such quantity of the product proven to be defective. Except for the replacement remedy, American Polywater shall not be liable for any loss, injury, or direct, indirect, or consequential damages resulting from product's use, regardless of the legal theory asserted.

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July 27, 2004

Specification
CG™ Cold Galvanize
(CG-13)

CG™ Cold Galvanize is an organic zinc rich coating for steel and ferrous metals that combines the resistance properties of an epoxy and the galvanic properties of zinc. This high performance epoxy compound fuses zinc to the metal substrate and protects against corrosion equal to Hot Dip Galvanizing. CG™ Cold Galvanize is self-healing and prevents creepage even when the surface has been penetrated or scratched. After curing, CG™ Cold Galvanize may be coated with conventional primers and finishes.

FEATURES

- 95% Organic Zinc in Dry Film
- Long Term Corrosion Protection
- Meets Mil Specifications

SPECIFICATIONS	
Appearance	Gray/Matte Finish
Coverage	10 – 15 Square Feet per Aerosol Can (CG-13)
Dry Film Thickness	1.0 to 3.0 mils (.025mm - .075mm)
Zinc Content	95% in Dry Film
Drying Time	To Handle – 30 minutes @ 70˚F (21˚C) To Topcoat – 3 hours @ 70˚F (21˚C)
Temperature Resistance	250˚F (121˚C) – Sustained, 300˚F (149˚C) - Intermittent
Weldable	Yes
Mil Specifications & Certifications	P-26915A - Type 1 Class A primer for Steel (USAF) DOD-21035A - Zinc Rich Galvanize Repair P-46105 - Weld through Zinc Rich Primer Salt Fog - Pass 1,000 Hours (ASTM B117) Humidity - Pass 500 Hours (ASTM D2247)

SURFACE PREPARATION

New Steel: Surface must be dry and free of contamination. Remove all weld splatter and grind all rough welds to a smooth contour. For severe exposure (immersion, chemical, etc.) near-white blast clean per SSPC SP 10-63T. For other exposures, blast clean per SSPC SP 6-63 to a maximum profile of 1.5 mils (.038mm).
Previously Painted Surfaces: Must be free of oil, grease, and other contamination. For best results, spot blast exposed areas to be coated. Power tool brushing may be used for minor touch-up.

PROPERTIES	
Specific Gravity	1.19
Solids by Weight	43%
VOC Lb/Gallon (Kg/L)	5.6 Lbs/Gallon (0.67Kg/L)
Flash Point	-156˚F (-104˚C) TCC for Aerosol
Shelf Life	24 months
APPLICATIONS	
Recommended Film Thickness	1.0 to 3.0 mils (.025mm - .075mm)
Cure Time	30 to 40 minutes. Air Dry

USAGE INSTRUCTIONS

Surface shall be dry, 5˚F (3˚C) above the dew point, with air temperatures greater than 50˚F (10˚C). Surface must be free of rust bloom. Shake can vigorously until agitator frees. Spray using light, even strokes about 18 inches (1/2 meter) from surface. Several thin coats are recommended. Allow 15 minutes drying time between coats. Final coat should dry thoroughly (up to 24 hours). To avoid clogging nozzle, invert can and spray until only air escapes.

CONTAINS

Zinc Dust (CAS 7440-66-6), 2-Butanone (CAS 78-93-3), Xylene, Mixed Isomers (CAS 1330-20-7), Ethyl Benzene (CAS 100-41-4), VMP Naptha-66 (CAS 64742-89-8) and Propane (CAS 74-98-6).

CAUTION

Keep away from Heat, Sparks, Open flames, Electrical equipment, etc. DO NOT MIX WITH WATER OR USE WATER FOR FIRE. (See MSDS Sheet).

American Polywater's

Technical Bulletin

FD™

Electrical Contact Cleaner

A Fast-Drying Cleaner for General Industrial and Maintenance Use

Description

FD™ Electrical Contact Cleaner is a fast drying, multi-purpose industrial and maintenance cleaner. It replaces ozone-depleting CFC's, trichloroethane, HCFC's, perchloroethylene and other carcinogenic chlorinated solvents. FD™ Electrical Contact Cleaner effectively dissolves industrial grimes, greases, lubrication fluids, silicone, tars, adhesives, and fluxes.

FD™ Electrical Contact Cleaner evaporates quickly without a residue. It is suitable for use in electrical maintenance as a replacement for 1,1,1-trichloroethane. Transformer oils, corrosion inhibitor compounds, silicone grease, semi-conducting paints, and many other kinds of electrical grime clean up quickly with Type FD™ Cleaner.

Typical Physical Properties

Dielectric Strength (ASTM D877)	36 KV
Relative Evaporation Rate	Fast
Residue (ASTM D 2369)	< 100 ppm
Flashpoint (ASTM D 56)	~ 20°F/-5°C
Initial Boiling Point	141°F/60°C
Specific Gravity	0.69
Percent Aromatics	< 0.1%
Propellant (aerosol only)	CO_2
Cleaning Strength	Excellent

Advantages

- Multiple packages to fit different end uses
- Fast evaporating
- Good general solvency power
- One cleaner for many needs
- Contains no CFC's or HCFC's
- Contains no chlorinated solvents
- Harmless to most plastics
- Non-conductive, non-corrosive, non-staining



FD™ Electrical Contact Cleaner aerosol (cat. # FD-9) has a variable spray head (low, medium, high) for better spray control.

Usage Directions/Performance

FD™ Electrical Contact Cleaner is suitable for many types of cleaning and degreasing, including contact cleaning and electrical maintenance cleaning. It can be used as a spray, wipe, or solvent rinse. FD™ Cleaner is effective at room temperature. It does not freeze and can be used in cold weather applications. FD™ Electrical Contact Cleaner is authorized by the USDA for use in federally inspected meat and poultry plants.

FD™ Cleaner has good solvency power. Cleaning time and effectiveness will vary based on the contaminant and cleaning method. Wiping or agitation speeds the cleaning. Experiment with your particular contaminant and conditions.

A comparison of FD™ Cleaner to other solvent types is charted below. A stainless steel surface is coated with 50 mils of contaminating compound. The surface is immersed and lightly agitated in FD™ Cleaner. The time at which the contaminant has dissolved is noted.

Silicone Electrical Insulating Compound	
Cleaner	**Cleaning Time**
FD™ Electrical Contact Cleaner	< 2 Minutes
Odorless Mineral Spirits	5 Minutes
Isopropyl Alcohol	> 5 Minutes

Hydrocarbon Lubricating Grease	
Cleaner	**Cleaning Time**
FD™ Electrical Contact Cleaner	< 3 Minutes
Odorless Mineral Spirits	> 5 Minutes
Isopropyl Alcohol	> > 5 Minutes

Cable Filling Grease (PE/PJ)	
Cleaner	**Cleaning Time**
FD™ Electrical Contact Cleaner	5 Minutes
Odorless Mineral Spirits	> 5 Minutes
Isopropyl Alcohol	> > 5 Minutes

Oxide Inhibiting Compound	
Cleaner	**Cleaning Time**
Type FD™ Cleaner	< 1 Minutes
Odorless Mineral Spirits	< 2 Minutes
Isopropyl Alcohol	> > 5 Minutes

FD™ Electrical Contact Cleaner contains no surfactants and leaves no residue once dried. For precision cleaning (residue free use), prevent recontamination with existing grime by finishing with a fresh wipe, spraying until the solvent runs clear, or rinsing in a fresh bath of FD™ Cleaner.

FD™ Electrical Contact Cleaner is fast evaporating and does not require forced air to dry. In areas where solvent has pooled, the part may be wiped with an absorbent, lint-free towel.

Evaporation Rate

FD™ Electrical Contact Cleaner:	40 mg/min.
111 Trichloroethane:	50 mg/min.
Perchloroethylene:	20 mg/min.
Isopropyl Alcohol:	10 mg/min.
Odorless Mineral Spirits:	.3 mg/min.

Compatibility

FD™ Electrical Contact Cleaner will not corrode or stain metal parts. It does not tarnish or corrode copper per ASTM D130 and D1729.

FD™ Electrical Contact Cleaner is compatible with most plastics and elastomers. Tables I and II show the effect of FD™ Cleaner on various plastics and rubbers.

Testing, shown in charts I and II, is based on a soak test described in ASTM D543. FD™ Cleaner may temporarily swell some rubber compounds. These rubbers should return to their original state after the cleaner has evaporated. Immersion will affect sensitive materials more than incidental contact of a spray or wipe. It is recommended that all plastic parts, gaskets, seals and O-rings be tested for specific use and exposure method.

FD™ Solvent Compatibility with Plastics and Elastomers

TABLE I

PLASTICS	AGING 72 HOURS AT 50°C		
	% WEIGHT CHANGE	% THICKNESS CHANGE	APPEARANCE
ABS	+0.81	0	NC
Acrylic	+0.06	+0.15	NC
CPE Thermoplastic	+6.49	0	NC
CPE Thermoset	-6.51	0	NC
Delrin®	+0.24	0	NC
Epoxy	+0.08	0	NC
Nylon 101	+0.70	+0.27	NC
Polycarbonate	+0.18	0	NC
Phenolic	+6.99	+9.00	NC
Polyethylene	+12.46	+3.78	NC
Polystyrene	+31.49	+33.12	SF
PVC	-0.03	0	NC
Teflon®	+0.07	0	NC
Tygon®	-0.17	+6.62	NC
Ultem® 1000	-0.08	+0.27	NC
Valox® 420	+0.10	+1.12	NC

TABLE II

ELASTOMERS	AGING 72 HOURS AT 50°C		
	% WEIGHT CHANGE	% THICKNESS CHANGE	APPEARANCE
EPDM	+100.88	+37.15	S
Neoprene	+2.36	+2.72	NC
Nitrile	+2.00	+5.26	NC
SBR	+16.96	+31.53	SS
Silicone	+65.97	+47.50	S
Viton®	+1.98	+4.43	NC

KEY:
NC = NO CHANGE SS = SLIGHT SWELLING
S = SWELLING SF = SOFTENING

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Delrin®, Teflon®, and Viton® are trademarks of Du Pont
Ultem® 1000 and Valox® 420 are trademarks of G.E. Plastics
Tygon® is a trademark of Norton Performance Plastics

Safety

FD™ Electrical Contact Cleaner has a low level of toxicity. As with any solvent, ventilation should be sufficient to keep vapors at safe levels. Avoid eye contact and excessive skin contact. Wash hands with soap and water after using.

FD™ Electrical Contact Cleaner is an extremely flammable liquid. It should not be used on energized equipment. FD™ Electrical Contact Cleaner should not be used for high temperature cleaning or exposed to pilot lights, flames or heated surfaces. Good industrial hygiene practice and appropriate precautions should be employed during use. See MSDS for specific details.

Storage

FD™ Electrical Contact Cleaner is classified as flammable. Keep containers cool, dry and away from sources of ignition and oxidizing materials. Do not expose aerosol cans to direct sunlight or temperatures above 120°F. Do not puncture or incinerate aerosol cans.

Package Options

Catalog No.	Description
FD-9	9-wt. oz. aerosol with adjustable nozzle (16 oz can) (12/cs)
FD-16LF	16-fl. oz. bottle with flip top (12/ cs)
FD-35LF	1-quart bottle with flip top (12/cs)
ST-R	Trigger sprayer fits pt. & qt. Bottles (12/cs)
FD-128	1-gallon can (4/cs)
FD-640	5-gallon pail (1 ea).
FD-Drum	55-gallon drum (1 ea)

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LIT-FDTECHB/4-03/C1000(8/04)

Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ 2000 Software

American Polywater® Corporation

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Polywater® Cable Preparation

CABLE PREPARATION PRODUCTS



Lint-free towels are critical for terminations

Precision Accessories that Safeguard Electrical Reliability

PRODUCT BENEFITS

- **Non-Conductive:** SP-ROLL leaves no conductive grit that could lead to tracking or arcing.
- **Durable:** SP-ROLL resists shredding and helps to evenly "pencil" semicon layer.
- **Convenient:** Snip the SP-ROLL for desired amount. Eliminates waste.
- **Versatile:** Use DT towels to apply bulk Polywater® cleaners.
- **Non-Linting:** DT towels leave no residue that could lead to tracking.

Eliminate Residue and Tracking Exposure

SpliceMaster® 120-grit, non-conductive, aluminum oxide sandpaper rolls (SP-ROLL) are used to remove semi-con shield residue and jacket polymers from cable insulation during splicing. SpliceMaster non-linting towels (DT-69 & DT-1212) contain no fiber binding adhesives and won't leave a residue.



Catalog # SP-ROLL



Cable prep using the DT-69



Bulk cleaning using DT-1212



Packages designed for mobility

Accessories for Safer Electrical Cleaning

The Polywater Cleaning/Drying Wipes (DT-69 and DT-1212) are made from a creped, highly absorbent, non-woven material. These non-linting, non-tearing, and non-snagging wipes have many uses beyond cable cleaning. SpliceMaster Sandpaper Rolls contain 50 yards of 1-inch wide, flexible, 120-grit, non-conductive aluminum oxide sanding cloth. Deposits can lead to tracking or arcing and must be removed prior to splicing electrical cable.

POLYWATER MEDIUM VOLTAGE ACCESSORIES

Catalog #	Package Description	Units/Case
SP-ROLL	1-inch x 50-yard roll of 120-grit sanding cloth	1
DT-69	Box with 200 – 6” x 9” dry wipes	1
DT-1212	Box with 100 – 12” x 12” dry wipes	1

SPECIFICATIONS AND APPLICATIONS:

- **Performance:** Specification-grade Polywater DT lint-free wipes contain no fiber-bonding adhesives and out-perform other commercially available towels. The use of rags or other non-specified wipes can leave lint residues on cable insulation that cause tracking. Bonding adhesives can dissolve in solvent, redeposit on cable insulation, and lead to failure. Recycled rags may also contain oils or other contaminants that can then be deposited onto the insulation.
- **Compatibility:** Only non-conductive sanding materials such as spec-grade Polywater SP-ROLL should be used. Emery cloth and standard store-bought sandpapers and abrasives can leave conductive grit residues that could lead to cable failure and hazardous conditions. Never abrade an energized cable.
- **Specify:** The key to a good splice and creating a reliable utility system is to use recommended materials and follow the proper procedures. Specify Polywater’s DT dry towels and SP-ROLL to ensure that conforming products are used in the field.

CONTACT US

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Polywater® Grime-Away™

CLEANING WIPES



Grime-Away makes cleaning tools easy

Heavy-Duty Cleaning Wipes for Hand and Tool Cleaning

PRODUCT BENEFITS

- **Excellent Cleaner:** Removes the toughest grimes.
- **Approval:** Salisbury by Honeywell approved hand cleaning for compatibility with rubber-insulating gloves.
- **Field Friendly:** Easy to store in truck bins.
- **Double-Sided Towel:** Textured on one side for scrubbing and soft on the other for wiping.
- **Moisturize:** Softens hands while cleaning tools and surfaces. Will not dry out hands.

Superior Cleaning Power

Grime-Away™ Wipes can be used to clean hands, tools, equipment, transformers, service vehicles, and work surfaces. Easily removes anti-oxidant compounds, hydraulic fluid, cable gels, dirt, silicone greases, adhesives, caulk, C-Cement, tar/asphalt, transformer oils, and more.



Removes contaminants that damage gloves



Cleans up PVC pipe cement

polywater.com | 651-430-2270

American Polywater® Corporation



Clean tools for better operation



Catalog # HTC-D72

Available in Single Wipes or the 72-Count Container

Grime-Away is a unique water-based cleaner that will not defat hands and cause them to dry out like most other hand and tool cleaners. Grime-Away is packaged in a multiple-use 72-count canister or individual wipes that store easier in tool pouches or lineman bags.

POLYWATER GRIME-AWAY

Catalog #	Package Description	Units/Case
HTC-D72	Dispenser with 72 10" x 12"/25 cm x 30 cm premoistened wipes	6
HTC-1	Saturated 10" x 12"/ 25 cm x 30 cm wipes	144

SPECIFICATIONS AND APPLICATIONS:

- **Physical and Electrical Properties:** Tested and approved for compatibility with rubber-insulating gloves. Salisbury by Honeywell used their "Criteria for Evaluating Chemicals in Contact with Salisbury Natural Rubber Lineman Equipment" to determine the effect of Grime-Away on skin contact with insulating gloves. Salisbury approves Grime-Away for cleaning hands which then contact insulating gloves (not for use on the gloves themselves). Document available upon request.
- **Insulating Rubber Goods:** To clean rubber-insulating line hose, grounds, blankets, sleeves, and gloves use Polywater® Rubber Goods Cleaner.

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SALISBURY
by Honeywell

Ref: Evaluation of the Effect of GRIME AWAY on Salisbury Class 2 Lineman Gloves:

A sample of Grime Away was evaluated for its effect on Salisbury Lineman Gloves Class 2 (red/black), using the in-house test protocol "Criteria for Evaluating Chemicals in Contact with Salisbury Natural Rubber Lineman Equipment".

Based on the results for this test, the following statement can be used to describe the use conditions of this material: -

"GRIME AWAY has only minor affects on the aged tensile strength and should not harm Salisbury Natural Rubber Lineman Equipment under normal conditions of use. Such conditions include minimal contact between the wipes and the Salisbury Natural Rubber Lineman Equipment. Salisbury Natural Rubber Lineman Equipment should also be cleaned after exposure".

The results of the tests are shown below: -

Physical Properties:

	Tensile (psi)		500% Modulus (psi)		Elongation (%)		Area Swell (sq.mm)	
	RT	Aged	RT	Aged	RT	Aged	RT	Aged
Original	4136	4604	1362	1474	710	720	650	650
Exposed	4212	4869	1360	1432	730	730	650	650
% Diff	+ 1.8	+ 5.8	- 0.1	- 2.8	+ 2.8	+ 1.4	0.0	0.0

Electrical Properties:

	Dry Electricals		Soak Electricals	
	Breakdown (kV)	Leakage (mA)	Breakdown (kV)	Leakage (mA)
Original	30.0	11.0	30.0	11.0
Exposed	30.0	11.0	30.0	11.0
% Diff	0.0	0.0	0.0	0.0

A copy of the procedure and acceptance limits is available on request.



Barry Richards BSc (Hons)
Laboratory and Development Manger 4/29/09



Live-Line Tool Cleaning

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CLEAN = SAFE

Live Line, Insulating, Rubber Goods Maintenance Products Meet OSHA Live-Line Tool Standards

S-1™ Hot Stick Wipe

The S-1™ Hot Stick Wipe cleans hot stick and treats with a water repellent as part of daily stick maintenance. Meets OSHA regulation 29 CFR part 1910.

- Convenient, Pre-Saturated, Lint-Free Wipe
- Dual Action - Cleans and Applies Water Repellent Film
- Does Not Remove or Adversely Affect Gloss Coat
- Evaporates Quickly
- No "Build-Up" Over Time
- Prevents Continuous Water Film on Stick in Wet Weather
- Removes Grease, Dirt, and Grime
- Designed for One-Time Use
- Meets IEEE Maintenance Recommendations (Std #978)
- Disposal Helps Compliance with OSHA Reg 1910.269 Part J

To view technical information go to:
Support Page: **www.polywater.com/hotstick.html**
Application Videos: **www.polywater.com/videos.asp**



Catalog #	Description	Units/Case
S-1	Saturated towelette	144

Insulated Fiberglass Boom Cleaners

The pre-wash wipe is a cleaner-saturated towel that cleans grease, tar, insects, creosote, salt spray, pine pitch, hydraulic fluid and road debris off fiberglass boom arms. The cleaner is water soluble, and washes off during subsequent water rinsing. Boom pre-wash does not adversely affect the gel coat on the boom. Available for use in a 72-count towelette canister or an individually saturated 2-foot-square towel.

The Boom Wash Concentrate is a specially formulated non-butyl water-based liquid that is mixed with water (1 part concentrate to 3-5 parts water) to make a mild water-based boom cleaner. Once rinsed and dried, the boom should be waxed with American Polywater Fiberglass Wax. The wax helps protect the boom's outer layer and ensures that water will bead up.

To view technical information go to:
Support Page: **www.polywater.com/boomwipe.html**
Application Videos: **www.polywater.com/videos.asp**



Catalog #	Description	Units/Case
B-1	24" x 24" saturated towel	24
B-D72	72-count saturated wipe dispenser	6
BWC-128	1-gal concentrate	4

Fiberglass Wax & Buff Kit

The Fiberglass Wax and Buff Kit contains a lint-free wipe saturated with a fast-hazing fiberglass wax and a soft lint-free towel for buffing the wax to a shine. This kit is suitable for use on non-conductive fiberglass booms and hot sticks.

The Fiberglass Wax is also available in a 16-oz can, the perfect size for maintaining insulated boom trucks. This wax hazes quickly and buffs easily to a shine. The wax leaves a long-lasting surface barrier that protects the insulated fiberglass booms.

To view technical information go to:
Support Page: **www.polywater.com/waxwipe.html**
Application Videos: **www.polywater.com/videos.asp**



Catalog #	Description	Units/Case
W-1	Wax saturated wipe with Dry Buffing Towel	72
W-16	16-oz. can	12

Polywater® Insulated Rubber Goods Cleaner

Polywater® Rubber Goods Cleaner is a specially formulated water-based cleaner for removing grease, dirt, carbon, creosote, and other grimes from insulating blankets, lineman's gloves, rubber sleeves, jumper cables, hot jumpers, and line-hose. Polywater® Rubber Goods Cleaner is safe for use on all natural and synthetic rubbers.

Unlike other water-based rubber cleaners Polywater® Rubber Goods Cleaner contains no hazardous ingredients and is pH neutral, making it safe for use on skin. Polywater® Rubber Goods Cleaner is also completely biodegradable and safe for the environment.

Polywater® Rubber Goods Cleaner is ready to use and is available in multiple, convenient packages. It works well as a daily cleaner for field use.

- Great pre-wash prior to machine washing
- No mixing required
- Excellent cleaning power
- Harmless to all elastomers (rubbers)
- Multiple package options
- Environmentally friendly
- Non-toxic and non-corrosive
- Not an RCRA-regulated hazardous waste



Catalog #	Description	Units/Case
RBG-D72	72-count saturated wipe dispenser	6
RBG-35LR	1-qt bottle with sprayer	12
RBG-128	1-gal	4
RBG-640	5-gal	1

To view technical information go to:
Support Page: **www.polywater.com/rubber.asp**
Application Videos: **www.polywater.com/videos.asp**

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ADHESIVES | **CLEANERS** | LUBRICANTS | SEALANTS WWW.POLYWATER.COM

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IEEE Guide for In-Service Maintenance and Electrical Testing of Live-Line Tools
Sponsor

Transmission and Distribution Committee of the IEEE Power Engineering Society

IEEE Std 978-1984

4.2 Periodic Inspection and Checking

Insulating tools should be visually inspected before use for indications that they may have been mechanically or electrically overstressed (see 5.1.1). Tools that show evidence of overstress (such as damaged, bent, worn, or cracked components) should be removed from service and evaluated for repair. Elongated or deformed rivet ends, for instance, indicate that excessive mechanical loading has occurred and has weakened or sheared the bond between the ferrules and the insulating pole.

The surface of each tool must be inspected before and after each use for contamination such as dirt, creosote, grease, or any other foreign material. If any of the above contaminants exist, the tool surface should be cleaned.

When the insulating member of a tool shows signs of accumulated contamination, surface blisters, excessive abrasion, nicks, or deep scratches the tool should be removed from service and cleaned or refinished as recommended by the manufacturer, and re-tested. Any moisture penetration will reduce the insulating properties of these tools.

When the tools have been exposed to excess moisture, their moisture content can be measured with a moisture meter, which is commercially available (see 4.5), or their general condition determined on the basis of ac dielectric- loss measurements (see 5.9)

4.3 Cleaning and waxing

Before each use, insulating tools should be wiped with a clean, absorbent paper towel or a clean, absorbent cloth and followed by wiping with a silicone-treated cloth.

Caution: Do not use cloths that have been washed in harsh solvents, since some residues on the cloth can be deposited on the pole surface

If simple wiping does not remove the contaminant then apply denatured alcohol with a paper towel or clean, absorbent cloth and follow by wiping with a silicone-treated cloth. Other solvents or cleaners may be used as recommended by the manufacturers of the insulating tools.

Caution: Do not use soap detergents, liquid or powdered form, such as 409, Fantastic, Comet, ND-150, Bon Ami, Ajax, etc, to clean fiberglass tool under field conditions because of the following problems:

(1) The above described cleaning agents will leave a conductive residue unless rinsed with generous amounts of water (usually not available in the field).

(2) Abrasive cleaners will destroy the surface gloss on the stick.

Note: All fiberglass tools that are subjected to such cleaning agents should be electrically tested under wetting conditions to ensure complete removal of residue from soap-type cleaners (see 5.3).

Waxing is not necessary after every use of the tools but rather as needed to maintain a glossy surface that will cause any moisture or water to bead on the surface (see 5.5). Before the tool is rewaxed, to avoid a wax buildup, the pole should always be cleaned with a solvent or cleanser recommended by the manufacturer of the tools.

Waxing imparts not only a glossy finish to the surface of the fiberglass but also adds to the electrical integrity of the tool by providing a protective barrier against dirt, creosote, and other contaminants, and moisture.

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345 East 47th Street, New York, NY 10017, USA

Copy of OSHA Regulation 1910.269 Part J – Live Line Tools

(j)
"Live-line tools."

(j)(1)
"Design of tools." Live-line tool rods, tubes, and poles shall be designed and constructed to withstand the following minimum tests:

..1910.269(j)(1)(i)

(j)(1)(i)

100,000 volts per foot (3281 volts per centimeter) of length for 5 minutes if the tool is made of fiberglass-reinforced plastic (FRP), or

(j)(1)(ii)
75,000 volts per foot (2461 volts per centimeter) of length for 3 minutes if the tool is made of wood, or

(j)(1)(iii)
Other tests that the employer can demonstrate are equivalent. Note: Live-line tools using rod and tube that meet ASTM F711- 89, Standard Specification for Fiberglass-Reinforced Plastic (FRP) Rod and Tube Used in Live-Line Tools, conform to paragraph (j)(1)(i) of this section.

(j)(2)
"Condition of tools."

(j)(2)(i)
Each live-line tool shall be wiped clean and visually inspected for defects before use each day.

(j)(2)(ii)

If any defect or contamination that could adversely affect the insulating qualities or mechanical integrity of the live- line tool is present after wiping, the tool shall be removed from service and examined and tested according to paragraph (j)(2)(iii) of this section before being returned to service.

(j)(2)(iii)

Live-line tools used for primary employee protection shall be removed from service every 2 years and whenever required under paragraph (j)(2)(ii) of this section for examination, cleaning, repair, and testing as follows:

(j)(2)(iii)(A)

Each tool shall be thoroughly examined for defects.

.1910.269(j)(2)(iii)(B)

(j)(2)(iii)(B)

If a defect or contamination that could adversely affect the insulating qualities or mechanical integrity of the live-line tool is found, the tool shall be repaired and refinished or shall be permanently removed from service. If no such defect or contamination is found, the tool shall be cleaned and waxed.

(j)(2)(iii)(C)
The tool shall be tested in accordance with paragraphs (j)(2)(iii)(D) and (j)(2)(iii)(E) of this section under the following conditions:

(j)(2)(iii)(C)(1)
After the tool has been repaired or refinished; and

(j)(2)(iii)(C)(2)
After the examination if repair or refinishing is not performed, unless the tool is made of FRP rod or foam-filled FRP tube and the employer can demonstrate that the tool has no defects that could cause it to fail in use.

(j)(2)(iii)(D)
The test method used shall be designed to verify the tool's integrity along its entire working length and, if the tool is made of fiberglass-reinforced plastic, its integrity under wet conditions.

(j)(2)(iii)(E)
The voltage applied during the tests shall be as follows:

(j)(2)(iii)(E)(1)
75,000 volts per foot (2461 volts per centimeter) of length for 1 minute if the tool is made of fiberglass, or

(j)(2)(iii)(E)(2)
50,000 volts per foot (1640 volts per centimeter) of length for 1 minute if the tool is made of wood, or

(j)(3)
Other tests that the employer can demonstrate are equivalent. Note: Guidelines for the examination, cleaning, repairing, and in- service testing of live-line tools are contained in the Institute of Electrical and Electronics Engineers Guide for In-Service Maintenance and Electrical Testing of Live-Line Tools, IEEE Std. 978-1984.

BE CLEAN! BE SAFE!



BOOM CLEANER



WAX



HOT STICK CLEANER



RUBBER GOODS CLEANER



GRIME-AWAY™ MULTI-PURPOSE CLEANER

BOOM CLEANER
B-1 ..... Prewash Wipe for Boom Maintenance
B-D72 .... 72-Count Boom Wipe Canister

WAX
W-1 ..... Fiberglass Wax & Buff Kit
W-16 ..... 16-Oz Fast-Hazing Fiberglass Wax

HOT STICK CLEANER
S-1 ..... Hot Stick Cleaner/Water Repellent Wipe

RUBBER GOODS CLEANER*
RBG-1 ..... Saturated Wipe
RBG-35LR .... Qt Spray Bottle
RBG-128 ..... 1-Gallon Jug
RBG-640 ..... 5-Gallon Pail
RBG-D72 ..... 72-Count Wipe Canister

GRIME-AWAY™ MULTI-PURPOSE CLEANER*
HTC-1 ..... Grime-Away™ Saturated Wipe
HTC-D72 ..... 72-Count Grime-Away™ Wipe Canister

* *Tested and approved for rubber goods use by SALISBURY by Honeywell*

American Polywater® Corporation
651-430-2270
www.polywater.com

Distributed by:

Polywater® S-1™ Wipe

HOT STICK CLEANER & WATER-REPELLENT WIPE



Wiping down a shotgun stick

For Live-Line Tool Cleaning & Maintenance

PRODUCT BENEFITS

- **Compatible with Sticks:** Does not remove or affect the gel coat.
- **Good Maintenance Practice:** Meets IEEE Std #978 and OSHA 29 CFR Part 1910 guidelines.
- **Beads Up Water:** Silicone coating prevents continuous conductive water film on stick in wet weather.
- **Good Cleaner:** Removes grease, dust, and grime while leaving a protective silicone layer.
- **Convenient Use:** Field-friendly, one-time-use towelettes.

Removes Electrical Tracking Contaminants

The Polywater® S-1™ Hot Stick Wipe cleans hot sticks and treats with a water repellent as part of the daily requirement to inspect and wipe sticks clean prior to each use. S-1 is effective at cleaning telescoping/extendo sticks so they glide into position without sticking.



Wiping down a telescoping hot stick



S-1 leaves a silicone coating



Revitalize fiberglass rodders



Catalog # S-1

Safeguard Your Live-Line Tools

The S-1 is a one-use wipe in a field-friendly package. Unlike the S-1, other reusable silicone wiping cloths don't clean live-line tools and become loaded with contaminants, rendering them ineffective.

POLYWATER S-1

Catalog #	Package Description	Units/Case
S-1	Saturated 8"x12" / 20 cm x 30 cm wipe	144

SPECIFICATIONS AND APPLICATIONS:

- **Versatile:** S-1 wipes make a big difference in cleaning and protecting shotgun sticks, hot sticks, bracing arms, cutters, and jumper holders.
- **OSHA Live-Line Tool Standard:** Requires that "Each live-line tool shall be wiped clean and visually inspected for defects before use each day." It notes that "a hot stick can become electrically unsafe because of … a combination of wetting, surface contamination, and a loss of surface gloss …" and "… the best defense against accidents is a clean, glossy stick that causes water to bead up …"
- **IEEE Maintenance Standard #978:** States the best way to clean a stick is to use isopropyl alcohol followed by a silicone wiping cloth. The S-1 cleverly combines both alcohol and silicone in a one-step process.

CONTACT US

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email: support@polywater.com

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Polywater® RBG™

INSULATED RUBBER GOODS CLEANER



Cleaning an insulating blanket

Safely Cleans EPDM and Natural Rubber Protective Products

PRODUCT BENEFITS

- **Excellent Cleaner:** Restores the high visibility of rubber goods.
- **Multiple Packages:** Can be used in the field, in tool rooms, and testing facilities.
- **Harmless:** Safe to use on EPDM and natural rubber.
- **Increases Reliability:** Uncovers hidden damage.
- **Biodegradable:** Environmentally friendly.

Reduce Tracking and Restore Visibility

Polywater® Rubber Goods Cleaner is a specially formulated water-based cleaner for removing grease, dirt, carbon, creosote, and other grimes from insulating blankets, lineman's gloves, rubber sleeves, jumper cables, hot jumpers, and line hose.



Blanket cleaning residue



Cleaning a ground with catalog # RBG-D72

polywater.com | 651-430-2270

American Polywater® Corporation



Cleaning a line hose



Rubber Goods Cleaner package options

Convenient and Safe to Use

Rubber Goods Cleaner is ready to use and available in multiple, convenient packages. It works well as a daily cleaner for field use. Unlike other water-based rubber cleaners, Rubber Goods Cleaner contains no hazardous ingredients and is pH neutral, making it safe for use on skin. Rubber Goods Cleaner is also completely biodegradable and safe for the environment.

POLYWATER RBG™

Catalog #	Package Description	Units/Case
RBG-D72	Dispenser with 72 - 10” x 12”/25 cm x 30 cm premoistened wipes	6
RBG-1	Saturated 8” x 12”/20 cm x 30 cm wipe	144
RBG-35LR	1-qt. bottle with sprayer (.95 liter)	12
RBG-128	1-gal. jug (3.8 liters)	4
RBG-640	5-gal. pail (18.9 liters)	1

SPECIFICATIONS AND APPLICATIONS:

- **Independent Testing:** Tested by an independent NAIL® for PET (North American Independent Laboratories for Protective Equipment Testing) accredited laboratory in accordance with ASTM F496, “Standard Specification for In-Service Care of Insulating Gloves and Sleeves.” Test data available on request.
- **Compatibility:** Passes all tests regarding synthetic and natural rubber in accordance with the ASTM and OSHA standards.
- **Performance Properties:** Passes Rubber Property—Effect of Liquids (ASTM D471) and Specification for In-Service Care of Insulating Gloves and Sleeves (ASTM F496).
- **Safe:** Not an RCRA-regulated hazardous waste.

CONTACT US

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Rubber Goods Cleaner

American Polywater® Corporation

TECHNICAL DATA SHEET

Description:

Polywater® Rubber Goods Cleaner is a specially formulated water-based cleaner for removing grease, dirt, carbon, creosote, and other grimes from insulating blankets, lineman's gloves, rubber sleeves, jumper cables, hot jumpers, and line-hose. Polywater® Rubber Goods Cleaner is safe for use on all natural and synthetic rubbers.

Unlike other water-based rubber cleaners Polywater® Rubber Goods Cleaner contains no hazardous ingredients and is pH neutral, making it safe for use on skin. Polywater® Rubber Goods Cleaner is also completely biodegradable and safe for the environment.

Polywater® Rubber Goods Cleaner is ready to use and is available in multiple, convenient packages. It works well as a daily cleaner for field use.

Performance Properties:

Polywater® Rubber Goods Cleaner is safe on synthetic and natural rubber. It is also an effective cleaner. Polywater® Rubber Goods Cleaner removes difficult grimes with minimal soaking and wiping.

Used insulating rubber goods are obtained from a local utility. Samples are blackened with ground grime, typical of the industry. Polywater® Rubber Goods Cleaner is allowed to soak into the surface for 2 minutes. 90% of the grime is removed after 3 wipes.

Property	Result
Rubber Property-Effect of Liquids (ASTM D471)	Passes all tests
Specification for In-Service Care of Insulating Gloves and Sleeves (ASTM F496)	Passes all tests
Cleaning Strength	Excellent



Product Benefits:

- Great pre-wash prior to machine washing
- No mixing required
- Excellent cleaning power
- Harmless to all elastomers (rubbers)
- Multiple package options
- Environmentally friendly
- Non-toxic and non-corrosive
- Not an RCRA-regulated hazardous waste

End Use:

- Blankets
- Sleeves
- Line Hose
- Jumper Cables
- Grounds
- Lineman's Gloves

Approvals:

Approved by Salisbury (Honeywell Safety Products) for use with Salisbury Rubber Protective Parts.

Physical Properties:

Polywater® Rubber Goods Cleaner is a safe, water-based cleaner with excellent cleaning properties.

Property	Result
Flashpoint (ASTM D93)	No flash
Initial Boiling Point	~ 212°F (100°C)
pH	Neutral
Specific Gravity	< 1%
VOC Content	0 g/L

Compatibility:

Protective rubber gloves are exposed to Polywater® Rubber Goods Cleaner as described below, then washed and dried at the testing laboratory.[1] Gloves are inspected for defects. Items that fail visual inspection are rejected and immediately rendered unusable. Rubber goods additionally undergo an electrical test as specified by the "class rating" of the item and the ASTM and OSHA Standards (maximum 40kv A.C.). Again, any item that fails the electrical test is rejected.

Rubber Goods Exposed to Surface Wipe

Class	Type	Visual Check	Electrical Test (max 40kv A.C.)
00	1	PASS	PASS
00	2	PASS	PASS
0	2	PASS	PASS
1	1	PASS	PASS
2	1	PASS	PASS

Rubber Goods Exposed to 5-minute Soak

Class	Type	Visual Check	Electrical Test (max 40kv A.C.)
0	2	PASS	PASS
1	1	PASS	PASS

Rubber Goods Exposed to 24-hour Soak

Class	Type	Visual Check	Electrical Test (max 40kv A.C.)
00	1	PASS	PASS
00	2	PASS	PASS
0	2	PASS	PASS
1	1	PASS	PASS
2	1	PASS	PASS

[1] Tested by an independent NAIL® for PET (North American Independent Laboratories for Protective Equipment Testing) accredited laboratory in accordance with ASTM F496, "Standard Specification for In-Service Care of Insulating Gloves and Sleeves."

Soak Testing:

Polywater® Rubber Goods Cleaner is compatible with plastics and elastomers. Immersion will affect sensitive materials more than incidental contact of a spray and wipe.

Immersed 72 Hours at 122°F (50°C)

Elastomers	% Weight Change	Appearance
EPDM	NC	NC
EPDM (Type II) blanket, line hose	NC	NC
EPDM gloves	NC	NC
Natural Rubber	NC	NC
Natural Rubber (Type I) blanket	NC	NC
Natural Rubber (Type I) gloves	NC	NC
SALCOR® (Type II) blanket	NC	NC
Silicone	NC	NC

Immersed 28 Days at 70°F (21°C)

Elastomers	% Weight Change	Appearance
EPDM	NC	NC
EPDM (Type II) blanket, line hose	NC	NC
EPDM gloves	NC	NC
Natural Rubber	NC	NC
Natural Rubber (Type I) blanket	NC	NC
Natural Rubber (Type I) gloves	NC	NC
SALCOR® (Type II) blanket	NC	NC
Silicone	NC	NC

KEY:

NC = No Change
S = Swelling
ES = Extreme Softening
C = Crazing
SS = Slight Swelling
D = Dissolved

Testing based on ASTM D471, "Standard Test Method for Rubber Property Effect of Liquids."

Type RBG™ Rubber Goods Cleaner is a trademark of American Polywater Corporation. SALCOR® is a trademark of W.H. Salisbury & Co.

Usage Directions:

Apply Polywater® Rubber Goods Cleaner by spraying, dipping, brushing, or wiping. Evenly coat rubber surface with cleaner. If using Polywater® Rubber Goods Wipe (RBG-1 or RBG-D72), open towel and use soft side to wipe down and fully wet surface of material.

Leave Polywater® Rubber Goods Cleaner on the surface of the material to be cleaned for 2 minutes or more to loosen and dissolve deposits. Allow cleaner to soak material longer for more difficult grimes. The longer Polywater® Rubber Goods Cleaner is on the surface the more it penetrates and breaks loose the creosote, dirt, grease, oils and other grimes without harming the rubber surface.

Once material has soaked, wipe surface clean with a rag or towel. A minimal amount of scrubbing may be required.

Rinse material with water and either dry with a clean cloth or air dry before use. Use Polywater® Rubber Goods Cleaner daily to clean the rubber's surface for visual inspections to uncover burns, cuts, nicks, crush points, and abrasions on equipment and gloves.



For best results leave RBG cleaner on rubber goods for at least 2 minutes before wiping or scrubbing down surface.

To see a demonstration video of Rubber Goods Cleaner go to www.polywater.com/videos.asp

Safety:

Polywater® Rubber Goods Cleaner has a low level of toxicity and is environmentally friendly. Good industrial hygiene practice and appropriate precautions should be employed during use. See SDS for specific details.

Safe LIVE LINE Equipment Practices:

Proper protection and performance of rubber protective equipment requires a detailed visual inspection before each use. Visual inspection of rubber goods should be performed before each use in accordance with ASTM F1236 "Standard Guide for Visual Inspection of Electrical Protective Rubber Products". Rubber protective equipment should be checked for:

- Abrasions, cuts, crush points, gouges, holes, punctures, and tears
- Embedded foreign objects
- Ozone cutting or ozone checking
- Swelling, softening, hardening, stickiness, and inelasticity
- Any other defect that damages the rubber insulating properties of the protective equipment

Cleaning of rubber protective equipment is necessary not only for visual inspections but to preserve the protective equipment. Creosote, dirt, grease, and other contaminants can be conductive, especially when combined with moisture from rain, snow, and fog. Protective equipment should be cleaned daily and whenever contaminated during use. **Strong industrial cleaners and solvents may cause permanent damage to the rubber protective equipment.** These products may cause rubbers to swell, soften, and lose electrical insulating properties.

Polywater® Rubber Goods Cleaner is safe to use on all rubber products, including: covers, line-hose, gloves, sleeves, and insulating blankets. Daily use of Polywater® Rubber Goods Cleaner makes inspection of protective equipment easier and helps to maintain the electrical insulating properties of the equipment.

Model Specification:

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

The rubber goods cleaner shall be a pH neutral, water-based solution that effectively cleans all types of grimes from insulating rubber goods. The cleaner shall remove a wide variety of contaminants such as hydrocarbon grease, carbon grime, creosote, tree sap, fertilizer residue, soils and dirt.

The rubber goods cleaner shall be safe for use on all types of rubber goods, insulating blankets, lineman's gloves, rubber sleeves, jumper cables, and line hose. EPDM rubber, silicone rubber, and natural rubber shall not be affected when immersed in the rubber goods cleaner and tested according to ASTM D471, Standard Test Method for Rubber Property-Effect of Liquids. Rubber goods exposed to a 24-hour soak shall pass high voltage testing in accordance with ASTM F496, Standard Specification for In-Service Care of Insulating Gloves and Sleeves. **Standard testing must be completed by an independent, NAIL® for PET (North American Independent Laboratories for Protective Equipment Testing) accredited laboratory to verify testing compliance.**

The rubber goods cleaner shall not require dilution, shall be pH neutral, and shall not have a flashpoint. The rubber goods cleaner shall be available in a number of packaging options, including presaturated towels and spray trigger bottles.

Order Information:



Type RBG™ Rubber Goods Cleaner is available in multiple package options.

Cat #	Package Description
RBG-1	Individual saturated wipe (144/cs)
RBG-D72	72-count saturated wipe dispenser (6/cs)
RBG-35LR	1-quart bottle with sprayer (12/cs)
RBG-128	1-gallon bottle (4/cs)
RBG-640	5-gallon pail (1 ea)

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Lit-RBGTECHSPEC2011/REV000

Makers of Boom™ Cleaner, Live-Line Tool Cleaning and Wax Wipes (W-1) and Hot Stick Cleaner and Wax Repellent Wipes (S-1)

Polywater®

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101 East Crossroads Parkway
Suite A
Bolingbrook, IL 60440

Toll Free: 877-406-4501
Telephone: 630-343-3700
Fax: 630-343-3838

Date: 4/18/2011

To: Joe Climaco

From: John Terzic

Re: Rubber Goods Cleaner

A sample of Rubber Goods Cleaner, Catalog #RBG-35LR, from Polywater Corporation, along with the MSDS and Technical Bulletin, were received to determine if this product can safely be used in field cleaning of our rubber protective products such as blankets and sleeves.

In reviewing both the Technical Bulletin and MSDS, this product appears safe for this application. To confirm it, we took natural rubber yellow sleeve, an EPDM orange blanket, and a yellow EPDM blanket. The three products were well rubbed with the cleaning solution and allowed to sit overnight with the top side covered with the solution. After 24 hours the three parts were rinsed and carefully examined. We found no discoloration or any other deformities. The three parts were also tested for physical properties before and after the test. Tensiles, elongation, and the hardness remained the same after the test.

In view of these findings, this product is safe for the cleaning of Salisbury rubber protective parts. The soap must immediately be rinsed out with water after the application.

All safety instructions given in the MSDS for this product must be observed. Also the application instructions on the product label must be observed.



Solar Panel Wash

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Polywater® SOLAR PANEL WASH

- Effective cleaner
- Biodegradable
- Does not contain solvents - no VOC's - non-flammable
- Phosphate-free - Chlorine-free
- pH neutral - non-caustic - non-alkaline
- Will not affect aluminum rails or racking like common detergents
- Does not require deionized or purified water rinse

Polywater® Solar Panel Wash is specially formulated for cleaning all types of solar panels without oxidizing or abrading aluminum rails and mounting apparatus. Many common car-wash soaps and window cleaners contain alkalines that promote oxidation and require a deionized water rinse.

Dust, bird droppings, pollution, pollen, tree sap, plant matter residue, etc., all reduce the overall effectiveness of solar panel generation capacity. A 2011 study by the World Academy of Science, Engineering and Technology concluded that "accumulated dust on the surface of photovoltaic solar panels can reduce the system's efficiency by up to 50%." Panels must be cleaned regularly to maximize system performance and longevity.

Even if only one panel in a string operates at 10% less than full capacity due to contamination, the entire string suffers the same 10% performance loss. This is known in the industry as the "Christmas-lights effect". The small cost of regular cleaning with Polywater® Solar Panel Wash yields big savings by increasing panel capacity.

Usage

For best results product should be diluted.

- For pressure washers, hose sprayers, etc., dilute 1:25
- For persistent soils, use a higher concentration of Solar Panel Wash and a soft cloth or brush to remove any remaining residues. Rinse the panels with 1:25 SPW™ solution and allow to dry. SPW™ leaves a clean surface that will dry faster, reduce spotting, and repel soil, making it easier to clean your panels the next time. As an option, rinse surface with water. Observe the condition of the panels and repeat the process above if necessary.
- For SPW™ application tips please go to our support page link.

Package Size	Polywater® Solar Panel Wash Product#	Units/Case
1-quart bottle with hose sprayer attachment (.95 liters)	SPW-35HS	12
1-gallon pail (3.8 liters)	SPW-128	4
5-gallon pail (18.9 liters)	SPW-640	1



SPW™ being used to clean panels.



Clean panels after using SPW™.

To view technical information on our website go to:
Support Page: **www.polywater.com/solarpanelwash.html**

American Polywater® Corporation

phone: 1-800-328-9384
1-651-430-2270
fax: 1-651-430-3634
email: support@polywater.com
11222 60th. St. N., Stillwater, MN 55082, U.S.A

ADHESIVES | **CLEANERS** | LUBRICANTS | SEALANTS WWW.POLYWATER.COM

Important Notice: The statements here are made in good faith based on tests and observations we believe to be reliable. However, the completeness and accuracy of the information is not guaranteed. Before using, the end-user should conduct whatever evaluations are necessary to determine that the product is suitable for the intended use.

American Polywater expressly disclaims any implied warranties and conditions of merchantability and fitness for a particular purpose. American Polywater's only obligation shall be to replace such quantity of the product proven to be defective. Except for the replacement remedy, American Polywater shall not be liable for any loss, injury, or direct, indirect, or consequential damages resulting from product's use, regardless of the legal theory asserted

LIT-SPWFLYER/REV003

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American Polywater® Corporation

11222 60th Street North
Stillwater, Minnesota 55082 U.S.A.

Telephone: 1-651-430-2270
Fax: 1-651-430-3634

www.polywater.com
support@polywater.com

General Maintenance Note:
Inspect the entire solar array system prior to cleaning to detect loose or broken wires, panels, or improperly functioning apparatus. Make necessary repairs before cleaning. Take before-and-after photos and system output readings for presentation to the customer. Schedule quarterly cleaning and maintenance with the customer to keep their system operating at its theoretical maximum output.

Solar Panel Wash SPW™ Usage Recommendation:
Recommended dilution ratio is 1 part Solar Panel Wash SPW™ to 25 parts water (25-1). For heavily soiled areas, use a higher SPW™ cleaner concentration, brushing or more rinsing. The catalogue # SPW-35HS hose adapter package has a selector switch atop the sprayer to toggle between the 25-1 and water-only ratios.

Always schedule panel cleaning early in the morning or at night when it is cool. This will minimize thermal stress on photovoltaic cells and protective glass which could damage the panels.

1) Use 25-1 Solar Panel Wash solution to rinse panels. Rinsing removes loose sand and debris from the panels, and protects the panel from scratching when brushes are used in Step 2 below. In locales known for hard water, deionized water can be used to dilute the SPW™. It is okay to rinse with local water only. **Wet only the number of panels that can be brushed and rinsed before the SPW™ solution dries.** Large arrays may need to be cleaned section by section. Use heavier amounts of SPW™ on areas with bird droppings or other organic matter.

2) Scrub panels with a very soft brush.(Hog's Hair is recommended.) Rinse the brush bristles frequently when cleaning heavily soiled arrays to reduce scratching. The use of brushes also helps agitate the SPW™; dirt tends to "carry" or be lifted from the panels better. Water alone--even deionized water--will not lift or carry dirt adequately. SPW™ is far more effective at removing residue and cleaning panels.

3) Allow the contamination and SPW solution to shed from the panel surface. Repeat Steps 1& 2 if hard to remove contamination remains.

4) Rinse the panels with a 25-1 SPW™ solution and let dry; otherwise, rinse with deionized water or local water supply.

5) If desired, buff dry, clean panels with blue microfiber cloths followed by white microfiber cloths for a fine finish.

SUNSHINE SOLUTIONS
Efficiency Matters

January 26, 2015

My company, Sunshine Solutions, specializes in cleaning and maintaining solar panels for residential, commercial and solar farm operations.

We pride ourselves on the way we clean solar panels. Just using deionized water alone will not effectively clean panels and won't make the job any easier the next time a scheduled cleaning is needed because you're not using any cleaner along with it to help remove dirt, soil, airline fuel residue and bird droppings. If you don't remove the dirt from panels it will scratch them so much that eventually it reduces their output.

Recently we used a product from American Polywater Corporation called "Solar Panel Wash" for two weeks on a variety of jobs, including a very tough one on a 314-panel solar array at a car dealership. This product was superior to the product we were using because we used less of it to clean the same number of panels, it didn't dry out as quickly on the panels as the other products, and it didn't leave a film.

Our cleaning operation differentiates itself from "window washing" companies because we carry insurance to be on roofs, can identify and fix operational problems in the solar system, utilize specialty brushes and micro fiber towels to buff the panels clean, and use Polywater's Solar Panel Wash, which is biodegradable and compatible with the solar panels' parts.

Our company plans to use Polywater's Solar Panel Wash on all of our projects to help make the job of cleaning easier the next time we are there to service them. By using their product and cleaning panels on a regular basis, your system will produce more output and last longer than others. Many owners don't realize the damage that can occur when they fail to clean their panels.

Sincerely,

JR
Sunshine Solutions
http://www.socalsunshinesolutions.com/

3283 Trade Center Drive Riverside, Ca 92507 951-787-9803

Hello Wendy,

The cleaning solution that we have been using is called Winsol Solar Brite. This product has worked pretty well for most of our projects. We used your product on an extremely dirty job and it out performed the product we are currently using.

Thanks,

Eric Jorgensen
Pampered Panels, Inc.
www.pamperedpanels.com

SOLARWORLD AMERICAS INC.
25300 NW Evergreen Rd.
Hillsboro, OR 97124
U.S.A.
Telephone: 800-947-6527
Fax: 503-844-3403
customerservice@solarworld.com
Website: solarworld.com

September 23, 2015

To whom it may concern,

American Polywater Corporation's Polywater® Solar Panel Wash SPW™ has been tested with SolarWorld photovoltaic solar modules under the accelerated test procedure outlined below.

Test Duration:

May 1 to May 14, 2015

Test Set-Up

Two new SolarWorld panels were provided to American Polywater and installed at a 45-degree angle on a south facing well at their factory location in Stillwater, MN.

To simulate precipitation and soiling the modules were sprayed for 15 minutes daily at 3 am with standard ground water. The ground water conductivity was measured at 95 µS and a water hardness of 67 parts per million (ppm).

Test Methodology

1. Monday: Between 8 and 10 am each panel was rinsed with a 25:1 solution of Solar Panel Wash SPW and water. The panels were then scrubbed with a soft nylon bristle brush and then rinsed with the same 25:1 solution of Solar Panel Wash SPW and allowed to air dry without any additional rinse.
2. Tuesday – Friday: Between 8 and 10 am each day the panels were rinsed with the 25:1 solution of SPW and allowed to air dry.
3. Saturday – Sunday: The panels were not cleaned over the weekends but were sprayed for 15 minutes at 3 am each day.
4. This process was run for a total of two weeks from May 1 to May 14

Results

The modules were returned to SolarWorld Americas and retested; their post-test performance was compared to their original manufactured performance. Polywater® Solar Panel Wash SPW™ did not have any appreciable effect on the module performance, antireflective glass coating or frame anodized coating.

Conclusion

When used as directed by American Polywater their Solar Panel Wash SPW™ is not an exclusion to the standard SolarWorld warranty. Care must be taken when cleaning solar panels. When cleaning solar modules with water or Solar Panel Wash SPW™ a soft bristle brush must be used and the modules should only be cleaned when they are cool; failure to do so may damage the module. Furthermore SolarWorld's performance and limited product warranty are never void but we do retain the right to deny claims based on the exclusions within the guarantee and limited product warranty document at the time of purchase.

Sincerely,



Eric Olson
Product Manager – Modules
SolarWorld Americas, Inc.

NO: TS20168267
Date: November 22, 2016

To: Christine Otam
American Polywater Corporation
christine@polywater.com
11222 60th Street North, Stillwater, MN 55082-9310 USA

Subject: Confirmation letter for usage of SPW to clean module

Dear Christine,

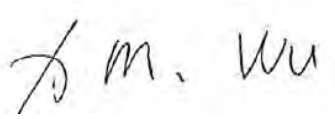
Thank you for your inquiry about our products. Canadian Solar modules have been certified in accordance with CSA certification body.

Canadian Solar hereby confirms that usage of American polywater's Solar Panel Wash (SPW) is approved for Canadian Solar's module cleaning. Canadian Solar suggests the module should be washed again using water after the usage of American polywater.

Please refer to CSI Installation Manual for the maintenance methods. Damages induced by inappropriate cleaning procedures will void Canadian Solar warranty.

Appendix 1: SPW Supplement 2016
Appendix 2: SPW use instructions 10-19-2016
Appendix 3: LIT-SPWTECHSPEC 2016

Sincerely,



Ximei Wu
Manager of Global Sales Technical Support
Email: ximei.wu@canadiansolar.com

Noark 诺雅克

Date: 24 December 2016

Subject: Confirmation Letter for Usage of SPW to clean Solar Panel Modules

To Whom it May Concern,

Noark-Electric Shanghai Co. Ltd (Noark) hereby confirms that usage of American Polywater's Solar Panel Wash (SPW) is approved for our Noark module cleaning. Noark suggests that the modules be rinsed again using water after the usage of American Polywater's SPW.

Please refer Noark's Installation and Maintenance Methods Manual for proper cleaning procedures. Damages induced by inappropriate cleaning procedures will void Noark warranty.

Sincerely: William Li

William Li

Electric Department Design Manager

William.li@noark-electric.com.cn

Noark-Electric Shanghai Co. Ltd.

No. 3857 Sixian Road, Songjiang District, Shanghai, China

Date: 29 December 2016

Subject: Confirmation Letter for Usage of SPW to clean Solar Panel Modules

To Whom it May Concern,

Beijing Sixvan Intelligent Systems Technology Co.Ltd.(Sixvan) hereby confirms that usage of American Polywater's Solar Panel Wash (SPW) is approved for our company solar module cleaning. Sixvan suggests that the modules be rinsed again using water after the usage of American Polywater's SPW.

Please refer to Sixvan Installation and Maintenance Methods Manual for proper cleaning procedures. Damages induced by inappropriate cleaning procedures will void Sixvan warranty.

Sincerely:

Manager-Purchasing Department

independenceday@qq.com

Beijing Sixvan Intelligent Systems Technology Co.Ltd.

509 D# Changping road 97 changping district beijing China

Date: 29 December 2016

Subject: Confirmation Letter for Usage of SPW to clean Solar Panel Modules

To Whom it May Concern,

Shanghai JA Solar Technology Co. Ltd. (JA Solar) hereby confirms that usage of American Polywater's Solar Panel Wash (SPW) is approved for our company solar module cleaning. JA Solar suggests that the modules be rinsed again using water after the usage of American Polywater's SPW.

Please refer to JA Solar Installation and Maintenance Methods Manual for proper cleaning procedures. Damages induced by inappropriate cleaning procedures will void JA Solar warranty.

Sincerely:

Kexiu.Qian

Manager-Purchasing Department

Kexiu.qian@jasolar.com

Shanghai JASolar Technology Co. Ltd.

36 Jiangchang Three Road, Zhebei District, Shanghai, China

TECHNICAL DATA SHEET

Description:

Polywater® Solar Panel Wash™ (SPW) effectively cleans PV panels and maximizes power generation. Its special formulation removes a wide range of contaminants such as air pollution residue, pollen, bird droppings, dust, and volcanic ash. It is designed with a rinsing aid to eliminate the need for deionized (DI) or reverse osmosis (RO) water. The SPW™ solution rinses clean without spotting.

Polywater® SPW™ works without damaging specialty polymer coatings and without oxidation or abrasion to metallic rails and mounting brackets. Its use has been approved by many global solar panel and cleaning equipment manufacturers.

Polywater® SPW™ is safe for users and the environment. It quickly biodegrades, so it will not affect surrounding plant life or water-table/aquifers. SPW™ contains no solvents and is non-corrosive.

Reduces Water Use:

Polywater® SPW™ is more effective than water alone. As a result, soils are removed more efficiently and *less water is used*. Field experience proves this:

Polywater® SPW™ was tested at a winery in India where the existing cleaning procedure used 5 liters of water alone per panel. Using a 25:1 water-to-SPW™ mix, only 3 liters were required to clean 10 panels. *Water use was reduced by a factor of 15*.

In a Mexican trial, approximately 1.7 liters of SPW™ solution was used per panel. Water use was also reduced in this field trial.

Polywater® Solar Panel Wash™ has a spot-free rinse, eliminating the need for deionized water. Elimination of deionized water yields more water savings, since it takes more than a gallon of water to create one gallon of DI or RO water.

Efficient cleaning saves water and is more environmentally appropriate. It is an effective cleaning method that also saves labor time.



Product Features:

- Effectively removes all types of contaminants
- Cleans efficiently, conserves water
- Works without deionized water
- Quick sheeting action—dries without spots
- Biodegradable—does not harm the environment
- Does not contain solvents or corrosive soaps
- Compatible with anti-reflective films, metal rails, and mastics

Approvals:

Polywater® Solar Panel Wash™ is approved for use on most types of solar panels by the following manufacturers:*

- Canadian Solar
- Solar World
- JASolar Technology Co.
- Sixvan Intelligent Systems Technology Co.
- Noark-Electric Co.

** Approval letters available upon request.*

Compatibility:

Polywater® SPW™ Solar Panel Cleaner is compatible with PV panels and is approved by multiple panel manufacturers. It is compatible with:

- Specialty Films
- Aluminum Rails
- Cables and Wiring
- Mastics and Sealants

Test Method: Panels were placed against a south-facing wall at a 45° angle, at American Polywater's factory in Stillwater, MN.

A sprinkler sprayed the panels with ground water for 15 minutes at 3:00 each morning. Water conductivity was measured at 95 µS, approximately 67 ppm water hardness. The panels were exposed to Polywater® Solar Panel Wash SPW™ using the following process over a two-week period:

1) Monday: Between 8:00 and 10:00 a.m. each panel was rinsed with a 25:1 solution of the Solar Panel Wash SPW™ in water. The panel was then scrubbed with a very soft brush, then rinsed again with the 25:1 SPW™ solution and allowed to dry without any further water rinse.
2) Tuesday–Friday: Between 8:00 and 10:00 a.m. each day, both panels were rinsed with the 25:1 SPW™ solution and allowed to dry.
3) The panels were not cleaned over the weekends, but the sprinkler continued to spray the panels with groundwater for 15 minutes at 3:00 each morning.

Conclusion: Modules were re-flashed after they were returned to SolarWorld. No degradation of the antireflective coatings or other irregularities to the panels were detected after application of American Polywater Corporation's Solar Panel Wash (SPW™).

Environmental Impact:

Polywater® SPW™ Solar Panel Wash is readily biodegradable per OECD Guidelines. Materials must be 60% biodegraded within 10 days to meet these OECD Guidelines. The resulting products of biodegradation are carbon dioxide and water. Because Polywater® Solar Panel Wash SPW™ is so biodegradable, it does not accumulate in the environment. Polywater® Solar Panel Wash SPW™ is the environmentally safe solution to cleaning solar panels.

Physical Properties:

SPW™ is a clear, odorless, non-caustic liquid cleaner that contains no solvents. It is freeze-thaw stable and safe to use.

Property	Result
Initial Boiling Point	~100°C
Specific Gravity	1.0
pH	Neutral
Solvent/Volatile Content	None
Phosphate Content	None
Ammonia Content	None
Flashpoint (ASTM D93)	None

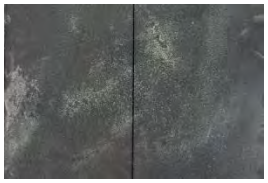
Cleaning Effectiveness:

SPW™ Cleaner removes a broad range of ash, dust, oils, and organic matter, rinsing the contamination clean from PV surfaces and aluminum rails.

Bentonite, oils, and salts were coated on glass panels to test cleaning efficacy. A 25:1 solution of the Solar Panel Wash SPW™ in water was used to clean the surface. Cleaning solution effectiveness was compared to a water control.

Panels are coated and dried for 24 hours to set. Contaminated surface is lightly and evenly sprayed with either SPW™ cleaning solution or DI water control. Wetted surface is lightly passed with soft cleaning brush, then rinsed with tap water. Result is noted.

Contamination	SPW Solution	Control
Bentonite and Mineral Oil	Excellent (4)	Poor (1)
Salt Solution and Bentonite	Good (3)	Fair (2)
Bentonite and WD-40®	Excellent (4)	Fair (2)



Before cleaning



Control *SPW*

SPW™ diluted 25:1 emulsified oils and lifts dusts. It simplifies and speeds the cleaning with less scrubbing and faster dry times.

Usage Directions:

General Maintenance Note:

Inspect the entire solar array system prior to cleaning to detect loose or broken wires and panels, or improperly functioning apparatus. Make necessary repairs before cleaning. Schedule quarterly cleaning and maintenance to keep system operating at theoretical maximum output.

Solar Panel Wash SPW™ Usage Recommendation:

Recommended dilution ratio is 1 part Solar Panel Wash SPW™ to 25 parts water (25-1). For heavily soiled areas, use either a higher SPW™ cleaner concentration or more rinsing. The cat #SPW-35HS hose adapter package has a selector switch atop the sprayer to toggle between the 25-1 and water-only ratios.

Always schedule panel cleaning early in the morning or at night when it is cool. This will minimize thermal stress on photovoltaic cells and protective glass that could damage the panels.

1) Use 25-1 Solar Panel Wash™ solution to rinse panels. Rinsing removes loose sand and debris from the panels and protects them from scratching when brushes are used in Step 2 below. In locales known for hard water, deionized water can be used to dilute the SPW™. It is okay to rinse with local water only. **Wet only the number of panels that can be brushed and rinsed before the SPW™ solution dries.** Large arrays may need to be cleaned section by section. Use heavier amounts of SPW™ on areas with bird droppings or other organic matter.
2) Scrub panels with a very soft brush (Hog's Hair or similar). Rinse the brush bristles frequently when cleaning heavily soiled arrays to reduce scratching. The use of brushes also helps agitate the SPW™; dirt tends to "carry" or be lifted from the panels better. Water alone—even deionized water—will not lift or carry dirt adequately. SPW™ is far more effective at removing residue and cleaning panels.
3) Allow the contamination and SPW™ solution to shed from the panel surface. Repeat Steps 1 and 2 if hard-to-remove contamination remains.
4) Rinse the panels with a 25-1 SPW™ solution and let dry; otherwise, rinse with deionized water or local water supply.
5) If desired, buff dry, clean panels with blue microfiber cloths followed by white microfiber cloths for a fine finish.

End Uses:

- Utility-Owned Solar Farms
- Industrial Arrays
- Commercial Arrays
- Residential Ground and Rooftop-Mounted Panels

Washing Panels Increases Performance:

Regular cleaning maximizes PV system performance and longevity. A 2011 World Academy of Science, Engineering and Technology study concluded that "accumulated dust on the surface of photovoltaic solar panels can reduce the system's efficiency by up to 50%."[1]

In an EPRI study, industry stakeholders estimate "panel washing can improve efficiencies by as much as 10-15%."[2]

Cleaning maximizes return on investment. It is especially effective on flat, low-tilt panels. Google cleaned solar panels on their campus for the first time after 15 months of operation, and energy output doubled. A second cleaning, 8 months later, resulted in a 36% increase in output.[3]

Even small areas of contamination can have a significant impact on panel performance. Solar cells connected in series are only as good as the lowest performing cell. Cleaning is also a good practice to avoid hot spots.

[1] Sulaiman S, et al, "Effects of Dust on the Performance of PV Panels." *World Academy of Science, Engineering and Technology. International Journal of Mechanical Aerospace, Industrial, Mechatronic and Manufacturing Engineering* Vol: 5, No 10, 2011. Web. 23 January 2017.

[2] "Addressing Solar PV Operations & Maintenance Challenges: A Survey of Current Knowledge and Practices." *EPRI*, Palo Alto, CA. 2010. 1008434.

[3] Lam, Winnie. "Should you spring clean your solar panels?" Google Official Blog, 31 July 2009. Web 23 January 2017.

Model Specification:

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

The solar panel cleaning solution shall not contain solvents or other volatile components. It shall be non-toxic with a neutral pH for safe handling. It shall be biodegradable based on OECD standards.

The solar panel cleaning solution shall remove a wide range of contaminants including dust, ash, clay, pollen, industrial grime, and bird excrement. The cleaning solution shall rinse with a thin, water-shedding film to minimize spotting.

The solar panel cleaning solution shall be compatible with all panel components. It shall be approved and tested by solar panel manufacturers.

Order Information:

Cat #	Package Description
SPW-35LF	1-qt bottle with flip-top cap (.95 liters)
SPW-35HS	1-qt bottle with hose sprayer attachment (.95 liters)
SPW-128	1-gal pail (3.8 liters)
SPW-640	5-gal pail (18.9 liters)

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LIT-SPWTECHSPEC/REV002.

American Polywater® Corporation

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1-651-430-2270
http://www.polywater.com (URL) support@polywater.com (e-mail)



Electro Fusion Products

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Polywater® EFW™

CLEANER FOR PE FUSION



Cleaning after cutting PE gas pipe

Cleaning Wipe for After the Peeling or Scraping Process

PRODUCT BENEFITS

- **99.8% Anhydrous Isopropyl Alcohol:** Exceeds industry standards.
- **Good Solvency:** Removes mud, dirt, and other contaminants from elbows, Ts, saddles, and MET fittings.
- **Large Cleaning Wipe:** Easier to handle and cleans larger areas.
- **Supportive:** Best choice to use after peeling, scraping, or cutting.
- **Effective Cleaner:** More consistent and stronger HDPE fusion splices.

PE Fusion Towelettes

Polyethylene pipe starts oxidizing as soon as it leaves the plant. Polywater® EFW™ Electrofusion Wipes clean the PE pipe surface after the peeling, scraping, shaving, or cutting process on gas, water, and sewer pipes. Cleaning is critical prior to the electrofusion or butt fusion process.



Cleaning fitting prior to fusion



Cleaning uncovers hidden contaminants

polywater.com | 651-430-2270

American Polywater® Corporation



Removing dirt with the EFW-1



Catalog # EFW-1

Comply with Industry PE Fusion Standards

Polywater EFW-1 is a lint-free, presaturated, 99.8% pure anhydrous alcohol wipe that exceeds the 96% isopropyl alcohol industry content standard. EFW has no water content and won't leave a residue.

When VOC regulations do not allow the use of alcohol, the Polywater ACE™ acetone wipe is the best industry alternative. This water-free solvent wipe also offers excellent cleaning with no residue. Acetone evaporates slightly faster than alcohol.

POLYWATER EFW

Catalog #	Package Description	Units/Case
EFW-1	Saturated 5" x 8"/13 cm x 20 cm wipe	50
ACE-1L	Saturated 10" x 12"/25 cm x 30 cm wipe	100

SPECIFICATIONS AND APPLICATIONS:

- **Methodology:** Numerous industry organizations and equipment and tool manufacturers agree that a wipe containing at least 96% isopropyl should be used in the PE fusion process. Cleaning after the peeling, scraping, shaving, and cutting process is critical to creating the best possible connection.
- **Proper Training:** Cleaning contaminants off the pipe prior to cutting, peeling, or scraping is also recommended. Contaminants such as directional drilling fluids, dirt, cutting fluids, and markers that contain oils all can affect the fusion process.
- **Caution:** Crews that use <96% anhydrous isopropyl, or utilize bulk containers versus presaturated wipes, risk contaminating the alcohol. Isopropyl alcohol is hygroscopic. When containers are left open for periods of time the alcohol absorbs and is diluted by water, again affecting the PE fusion process.

CONTACT US

1-800-328-9384 Toll Free
1-651-430-2270 Main
1-651-430-3634 Fax

email: support@polywater.com

IMPORTANT NOTICE: The statements here are made in good faith based on tests and observations we believe to be reliable. However, the completeness and accuracy of the information is not guaranteed. Before using, the end-user should conduct whatever evaluations are necessary to determine that the product is suitable for the intended use.

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American Polywater® Corporation

11222 60th Street N | Stillwater, MN 55082 USA

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Polywater Video Search Page

These videos demonstrate Polywater products and their use and application. Product relevant videos are also shown on the resource sidebar on the detailed product page. The best way to use this list is to search using subject (e.g., duct block, pedestal repair, cable lubrication) to narrow the list. The link will start the video on a separate browser tab.

http://www.polywater.com/polywater-video-search/

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American Polywater® Corporation

Safety Data Sheet Search Page

The Safety Data Sheets (SDS) for Polywater products are linked below. All Safety Data Sheets are in the GHS (Global Harmonized System) hazard classification format.

Use the search box to search by product name (e.g., “Bonduit”) or product catalog prefix (e.g., “BT-“). Please contact customer service if you cannot find the SDS you need.

http://www.polywater.com/polywater-sds-search/

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American Polywater® Corporation

Polywater Calculators

These on-line calculators determine appropriate product quantities based on job details. Look through or search the list using subject (e.g. duct block, lubrication, etc.) to narrow the list. The calculator will open on a separate browser tab.

http://www.polywater.com/polywater-calculators/

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FOR MORE INFORMATION:

www.polywater.com

Email: support@polywater.com

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